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Cost of Equity and Property Insurance: Evidence from China

Yihui Jia

A thesis submitted for the degree of Doctor of Philosophy

University of Bath

School of Management

June 2013

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This thesis is dedicated to my father, Haiquan Jia
for his unwavering love and support.

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ABSTRACT

This thesis addresses the question of whether corporate risk management adds value to a firm by examining the linkage between the cost of equity capital and property insurance in China. Over the last decade or so, several studies have examined the direct impact of risk management (derivatives or insurance use) on firm value. Utilizing an agency theory framework, the present study adds to the extant literature by investigating the corporate risk management-value relation from a more focused and novel perspective using a panel data set of 395 publicly listed Chinese companies (PLCs) for the period 2003-2007. The capital asset pricing model (CAPM) and modified price earnings growth (MPEG) models are employed to estimate the cost of equity. The results of the study suggest that Chinese PLCs purchasing property insurance tend to have lower costs of equity. Also a non-linear U-shape relation between the cost of equity and the extent of property insurance use is found. Given the inflection point occurs above the 90th percentile of the sample of firms, property insurance appears to be beneficial to most Chinese PLCs. The present study also shows that property insurance reduces the cost of equity by mitigating agency problems such as the managerial risk aversion incentive. Indeed, this is the first study that finds evidence that agency theory-based arguments appear to be appropriate in explaining the relation between property insurance use and the cost of equity. The empirical results are further robust to within-firm and cross-firm variations and unlikely to be driven by endogeneity problem. Therefore, the present study contributes new and important insights on the role of insurance - a pure risk hedging (indemnity) contract - in contributing to improvements in the market value of firms. This aspect of the research is particularly important in major emerging markets, such as China, that are attracting increasing attention from domestic and foreign investors but still suffer from severe market imperfections (e.g., information asymmetry) and an undeveloped financial and legal infrastructure compared with Western countries. Therefore, it is concluded that the results of this study could have potentially important commercial and/or public policy implications for corporate stakeholders with an interest in the Chinese corporate sector.

LIST OF ABBREVIATIONS

AEG Model	Abnormal Earnings Growth Model
AMEX	American Stock Exchange
APT	Arbitrage Pricing Theory
ASBE	Accounting Standards for Business Entities
BSAM	Bureau of State Assets Management
CAPM	Capital Asset Pricing Model
CBRC	China Banking Regulatory Commission
CIE	Chinese Industrial Enterprises
CIRC	China Insurance Regulatory Commission
CSRC	China Securities Regulatory Commission
DDM	Gordon Dividend growth model
EPS	Earnings per Share
FDI	Foreign Direct Investment
FF3F	Fama-French Three-Factor
FM Regression	Fama-MacBeth Regression
Forex	Foreign Exchange
GAAP	Generally Accepted Accounting Principles
GDP	Gross Domestic Product
HKSE	Hong Kong Stock Exchange
HSBC	Hong Kong and Shanghai Banking Corporation
IAS	International Accounting Standards
IMF	International Monetary Fund
IPO	Initial Public Offering
LLC	Limited Liability Company
MOF	Ministry of Finance
MPEG	Model Modified Price Earnings Growth Model
NASDAQ	National Association of Securities Dealers Automated Quotation System
NBSC	National Bureau of statistics of China
NPV	Net Present Value
NYSE	New York Stock Exchange
PBOC	People's Bank of China

PEG Model	Price Earnings Growth Model
PICC	People's Insurance Company of China
PLCs	Publicly Listed Companies
QFII	Qualified Foreign Institutional Investors
RIV Model	Residual Income Valuation Model
R-L Model	Rubinstein-Leland Model
ROE	Return on Equity
SGX	Singapore Exchange
SHFE	Shanghai Future Exchange
SHSE	Shanghai Stock Exchange
SOEs	State-Owned Enterprises
SZSE	Shenzhen Stock Exchange
TCE Theory	Transaction Cost Economics Theory
UK	United Kingdom
US	United States
WACC	Weighted Average Cost of Capital
WMW Test	Wilcoxon Mann-Whitney test
WTO	World Trade Organization

CHAPTER 1. OVERVIEW OF THE STUDY

1.1 Introduction

Whether a firm is rewarded by engaging in the risk management is an important but nevertheless open question in the finance literature. Under the Modigliani and Miller (1958) framework, risk management decisions do not impact on the market value of a firm as shareholders can costlessly diversify their risks across a balanced portfolio of investments. However, there is ample evidence to suggest that due to market imperfections - for example, financial distress/bankruptcy (Smith and Stulz, 1985), taxes (Stulz, 1996; Leland, 1998), and agency problems (Bessembinder, 1991; Froot, Scharfstein, and Stein, 1993) risk management can be a value enhancing activity. Instead of examining the impact of property insurance an overall proxy of firm value-Tobin's Q - as recent research (e.g. Zou, 2010) has done, this thesis investigates specifically how property insurance affects firm value directly through the cost of equity.[1] The present study thus offers a more focused, novel and 'cleaner' test of financial benefits of commercial insurance buying decisions then has hitherto been the case.

It is widely acknowledged in the finance literature that the cost of equity capital is fundamental to corporate strategic decisions as it impacts on firms' profitability, market share and ultimately, their traded market value (Easley and O'Hara, 2004, p. 1553; Cummins and Phillips, 2005, p. 442). What factors that influence the cost of equity capital of firms are therefore important considerations for investors, financial analysts and other stakeholders with an interest in the market pricing (valuation) of corporate assets. A key consideration influencing the pricing of a firm's assets is the availability of public and private information regarding the exposure of those assets (and their ability to generate cash flows) to future risks (Fama and French, 1992, 1993). One

[1] Botosan (2006, p. 31) defines the estimated (implied/imputed) equity cost of capital (r) as ". . . the minimum rate of return equity investors require for providing capital to the firm." In other words, the cost of equity is an opportunity cost concept. The cost of equity can also be applied as the risk-adjusted discount rate to expected future cash flows in order to determine the market value of a firm (Lee, Walker and Christensen, 2006, p. 12). Put another way, the cost of equity can be viewed as the internal rate of return at which the present value of future cash flows is equal to the current share price.

financial contracting technique that is commonly used by companies to mitigate asset-risk is property insurance (Mayers and Smith, 1981, 1982, 1987; Ashby and Diacon, 1996; Aunon-Nerin and Ehling, 2008)[2]. Cassidy, Constand and Corbett (1990) demonstrate empirically that firms' traded value increases after planned rises in risk management(including insurance) spending were announced to shareholders of United States (US)-based publicly listed companies (PLCs). Sprecher and Pertl (1983) provide further US evidence that severe loss events reduce value for shareholders implying that the corporate purchase of property insurance is likely to be a positive net present value (NPV) project (see also Ashby and Diacon, 1996). Minton and Schrand (1999) also report that firms with greater cash flow volatility (such as that arising from catastrophe) tend to face high costs of raising external capital and so invest less in positive NPV projects. Therefore, hedging (insurance) can increase value for firms by reducing cash flow risk. In addition, Géczy, Minton and Schrand (1997) and Haushalter (2000) demonstrate that managers of firms are more likely to use risk management techniques (such as insurance), and use them to a greater extent, when they face tight financial constraints and/or they have greater growth opportunities. Therefore, information on the amount of property insurance purchased by a firm could influence its cost of equity capital, and therefore, its traded value, particularly in asymmetric markets such as China (Zou, 2010).

It is well known that in private credit negotiations assets-based (property) insurance helps to reduce agency costs for capital suppliers thereby reducing borrowers' market cost of capital (Zou and Adams, 2008a, 2009). Grace and Rebello (1993) also point out that the managerial purchase of property insurance can provide a positive signal to financial markets as to the quality of productive assets and their potential to generate future cash flows. Hau (2006) further reports that property insurance provides additional liquidity to firms that have to replace lost and/or impaired assets arising from catastrophes in order to restore productivity and fulfil their contractual obligations to customers. Hau (2006) adds that an uninsured property loss could increase a firm's cost of capital leading to a downgrade in its credit rating, enhanced business disruption, and reduction in free cash flows. Another argument advanced by such scholars as Doherty

[2] Insurance is a risk management (indemnification) technique that helps to alleviate business risks (e.g., the adverse effects of environmental uncertainty on a firm's current and prospective earnings ability) and financial risks (e.g., the bankruptcy risk faced by capital providers in investing in/lending to users of funds) (Doherty, 2000).

and Smith (1993) and Doherty (2000) is that property insurance not only reduces cash flow volatility in companies but helps managers to 'filter out' the effects of unanticipated shock events (e.g., catastrophes) on traded share prices by reducing bankruptcy risk (so-called extreme 'left-tail outcomes'). Doherty and Lamm-Tennant (2009) further point out that by reducing the "noise" effect of unanticipated insurable losses and increasing the signalling power (i.e., information content) of corporate earnings, insurance provides investors with a potentially clearer picture of a firm's underlying ability to generate future cash flows and thus its economic value.

1.2 Rationale for the Research Project

The subject investigated in the present study is potentially important as the cost of equity is a major determinant of a company's weighted average cost of capital (WACC) that is used as the discount rate in determining the NPV of investment projects[3] and evaluating capital budgeting decisions (Heinkel, Krau and Zenchner, 2001; Lee et al., 2006). What is more, Sharfman and Fernando (2008, p. 570) argue that the link between risk management (such as insurance) and the cost of equity capital are fundamental strategic issues from the stand point of the firm and capital markets. This is because changes in (actual and perceived) levels of a firm's riskiness decreases its cost-base and so potentially increases its ability to make greater profits from given levels of revenue generated.

Furthermore, the linkage between risk management (insurance) and the cost of equity is particularly important in an emerging market such as China where the funding of corporate investment opportunities can be obfuscated by severe information asymmetry problems (Aharony, Lee and Wong, 2000) and poorly developed legal and financial systems (Ge and Qiu, 2007), and where business activities can be disrupted as a result of environmental perils such as earthquakes and floods (Li and Peng, 2008). Zou and Adams (2008a) and Zou and Adams (2009) investigate the relation between property

[3] Lee et al. (2006) report that the WACC is the total cost of financing the operations of the firm and can be expressed as: $WACC = Ke_t\ (1-(D_t \div V_t) + Kd_t(1-\tau_c)(D_t \div V_t)$ where Ke_t is the cost of equity, Kd_t is the cost of debt; D_t is the value of debt; V_t is the total value of the firm calculated as the sum of the value of equity and debt; and τ_c is the marginal rate of corporation tax. The cost of debt of listed companies is usually calculated as the sum of the cost of bank loans and cost of corporate bonds issued. However, the costs of bank loans of Chinese PLCs are not publicly available. As a result, an accurate esimate of the WACC for Chinese PLCs is not able to be computed in the current study.

insurance, debt capacity (leverage) and the cost of debt among PLCs in China. They find that property insurance mitigates information asymmetry problems, reduces the costs of financial distress and bankruptcy, and helps to expand corporate borrowing capacity as well as reducing the cost of debt. Their observation is consistent with the findings from Graham and Rogers' (2002) research on hedging activities in the US corporate sector[4]. Moreover, in the first direct test of the link between property insurance and firm value (measured by Tobin's Q) Zou (2010) finds that assets (property) insurance is generally beneficial to shareholders though over-insurance can be value reducing[5].

Stulz (1996, p. 24) further postulates that besides increasing corporate debt capacity, hedging (e.g., via insurance) could, by reducing downside financial distress/bankruptcy risks, reduce the cost of equity, and thus encourage investors to increase their equity stakes in well-hedged (insured) firms. This is additional to the possibility that ex-post financing mechanisms, like property insurance, could help to release companies' holdings of equity capital and so reduce its cost of usage (Shimpi, 2002)[6]. In other words, purchasing insurance can be viewed as a strategic choice alternative to using equity (Sharfman and Fernando, 2008, p. 273). Hedging through the use of insurance could also benefit shareholders as it reduces unobservable uncertainty and thus enables investors to optimize their portfolio choices and maximize their private wealth objectives (De Marzo and Duffie, 1995). Furthermore, Poshakwale and Courtis (2005, p. 433) report that for international banks, disclosing risk management information in the annual report and accounts was the most significant factor in reducing the cost of equity. Indeed, in a survey of the importance of corporate risk management among financial

[4] Warner (1977) and Yamori (1999) show that bankruptcy costs are typically low compared with the potential costs of financial distress, suggesting that bankruptcy risk per se may be less important in motivating the corporate decision to buy property insurance than theory suggests.

[5] Tobin's Q (defined as the ratio of the market value of equity and debt to the book value of total assets) could be an imprecise proxy for firm value as it could reflect firm size and industry effects as well as considerations such as market share (Zou, 2010). As noted in section 1.1 of this chapter, the current study is thus potentially a more robust test of the link between property insurance and firm valuation compared with Zou (2010).

[6] The reasoning here is that the financial savings realized from releasing equity are greater than the cost of the premiums that firms' are charged in the insurance market. In these circumstances, risk transfer via insurance can be more economical and efficient than risk retention with capital coverage and so likely to increase the traded value of firms.

analysts in the United Kingdom (UK), Ashby and Diacon (1998, p.39) found that reducing the cost of equity capital was viewed as an important attribute of purchasing corporate insurance. All this implies that property insurance could be a major determinant in reducing the cost of equity capital in the nascent Chinese corporate sector.

Prior studies have not directly examined the effect of property insurance on the expected cost of equity capital for industrial companies operating in China or indeed, any other jurisdiction[7]. This study therefore seeks to fill this gap in the literature by using a unique 2003-2007 panel dataset to examine the relation between property insurance purchase and the cost of equity in Chinese PLCs.[8] More specifically, the two main research questions that will be investigated in this study are as follows:

Research Question 1: Does property insurance affect firms' cost of equity capital?
Research Question 2: If it does, then to what extent does property insurance impact on firms' cost of equity capital?

1.3 Aim and Objectives of the Research

This study examines empirically the relation between property insurance and the cost of equity among PLCs in China. To achieve this aim, the project has five distinct objectives:

1. To examine the institutional environment within which Chinese PLCs operate. In particular, the unique setting of China's financial markets and the salient features of Chinese PLCs are examined.

[7] Zou and Adams (2008a) point out that the paucity of prior empirical tests is due to the off-balance sheet nature of corporate insurance information and the associated lack of public disclosure. Some prior US studies (e.g., Cummins and Harrington, 1985; Davidson, Cross and Thornton, 1992) have examined whether insurance affects the equity cost of capital. However, these studies have inherent limitations (e.g., the use of aggregate data; small samples). By using firm-specific data the present study enables a more precise and rigorous test of the insurance-cost of capital relation to be carried out.

[8] The insurance premium data are obtained from database of Chinese industrial enterprises (CIE) compiled by National Bureau of Statistics of China (NBSC). The CIE data only provides insurance premium data from 2003 to 2007, because insurance premium data have not been routinely collected by the NBSC since 2008.

2. To select an appropriate theoretical framework from a review of the academic literature.

3. To develop hypotheses (drawn from agency theory) and test those hypotheses empirically by means of univariate and multivariate (panel data) statistical analysis.

4. To explain and evaluate the empirical results.

5. To make conclusions, and consider the implications for policymaking and future research.

1.4 Contribution of the Research

The study should contribute to the existing insurance and finance literature, and generate regulatory/practical implications in at least four important:

1. Empirical evidence on the relation between the cost of equity capital and property insurance is important because prior research (e.g., Doherty, 2000; Graham and Rogers, 2002; Swiss Re, 2005; O'Brien, 2006) suggests that corporate financing and risk management decisions are inextricably bound. For example, the contingent capital attributes of insurance can reduce the level of retained equity and so maximize reported returns on equity. More importantly, the monitoring function provided by insurers helps to minimize the risk of asset depletion and moral hazard (carelessness) by agent-managers. (e.g. see Diamond, 1984) In other words, insurance mitigates the agency costs of equity. However, prior research has not tested (e.g., due to limited availability of public data) the relation between the cost of equity capital and property insurance, and so this study contributes new and important insights on the interplay between the cost of capital and risk management that might be useful for insurance suppliers, brokers, managers, industry regulators, investors, and others. For example, lowering the cost of equity could be a key motivating factor for the corporate purchase of property insurance in China.

2. This study provides new information on the relation between the cost of equity capital and risk management by utilizing a unique corporate insurance database. Unlike the use of financial derivatives' data, which have characterized most previous risk management studies (e.g., Allayannis and Weston, 2001; Haushalter, Klasa and Maxwell, 2007; Géczy, et al., 1997, 2007; Gay, Lin and Smith, 2011), insurance being a pure hedge (indemnity) contract cannot be used for speculation (Zou, 2010)[9]. Additionally, basis risk (where the hedge does not completely cover the risk exposure) can be a concern for users of derivatives and this could help explain both intra-industry and inter-industry variations in the use of derivative instruments (Haushalter, 2000, p. 147). Aunon-Nerin and Ehling (2008, pp. 298-299) go further in that they argue that corporate risk managers often do not have the expertise to accurately determine whether or not risk exposures should be hedged, and if so, the extent to which such risks should be hedged. Therefore, managers could be inhibited in their ability to apply financial derivative instruments effectively in dealing with strategic risks. The inability of decision-makers in firms to effectively manage risk exposures also means that it can be difficult in practice to ascertain whether firms use derivatives to hedge, speculate, or indeed, engage in a combination of these activities. For these reasons, the present study provides a potentially cleaner test of the research hypotheses than would be the case using financial derivatives data.

3. The linkage between risk management (insurance) and the cost of equity is particularly important in an emerging market, such as China, where the funding of corporate investment opportunities can be obfuscated by severe information asymmetry problems and poorly developed legal and financial systems. Therefore, the study of Chinese market provides a good opportunity for testing and refining financial economics-based theories on the relation between cost of equity and risk management. The methodology and results of this study could thus act as a useful framework and benchmark for future insurance-based

[9] Zou, Adams and Buckle (2003) also report that derivatives markets are relatively undeveloped in China compared with Western developed countries such as the UK and US.

research in both China and other Asian countries, particularly those with a similar economic structure and political history to China.

4. China's rapidly expanding financial markets and the increasing number of Chinese companies seeking overseas listing status has offered international investors increased prospects for risk diversification (Zou and Adams, 2006). However, Lee and Rui (2000) observe that a key inhibitor to the efficient operation of financial markets in China is the lack of knowledge held by investors (particularly those from overseas) as to the future growth opportunities of companies with different ownership and control structures (e.g., State versus private shareholdings)[10]. Therefore, this study should provide intuitive insights as to whether investors in China price securities differently for firms purchasing property insurance compared with firms that do not insure or do not insure to any significant degree. Moreover, the research project could be of potential relevance to managers, policymakers, investors, and others with an economic interest in China. For example, by enabling the managers of PLCs to better understand the effects of insurance purchases on business operations. This could also help them improve their risk management practices in the future.

1.5 Research Methods

To achieve the stated aim and objectives of the project, a combination of literature-based and empirical research methods will be employed as follows:

1. A search and analysis of the relevant literature leading to the selection of an appropriate theoretical framework to guide empirical analysis.

2. A statistical analysis of panel data for the period 2003-2007 using data from published sources mainly the CIE database complied by the NBSC (see also footnote 8). The panel dataset is supplemented by Datastream, the CSMAR

[10] Credit ratings in emergent markets (such as China) are far less common than they are in more developed economies such as the UK and US (Ferri, Liu and Majnoni, 2001). This feature compounds the information asymmetry problems for investors (particular those from overseas) and underscores the importance of insurance in providing enhanced surety for capital suppliers.

Securities Research Database (developed by Shenzhen GTA Ltd. and Hong Kong Polytechnic University) and WIND Financial Information System (developed by Shanghai Wind Ltd.). The data used in this study are analyzed using descriptive, univariate, and multivariate statistics. Robustness tests, including a two-stage instrument variable approach, are also conducted to control for endogeneity.

3. Recent costs of equity metrics reported in the literature are evaluated for choosing the estimation of the cost of equity for this study. The classical capital asset pricing model (CAPM) is first utilized to estimate the cost of equity. An alternative market-based accounting valuation model - the modified price growth in earnings (MPEG) proposed by Easton (2004) - is also employed for the purpose of empirical comparison.

1.6 Assumptions

The study is predicated on nine main assumptions as follows:

1. Managers of Chinese PLCs have discretion to make investment and financing decisions (including insurance) independently of State officials. This assumption is considered to be justified as considerable progress has been made in terms of the degree of autonomy assigned to company managers since China embarked on its program of market reforms in 1978 (e.g., see Tam, 2000; Zou et al., 2003).

2. The concepts of 'value' and 'risk' whilst independent of each other under the CAPM are nonetheless inter-related under imperfect market conditions, such as information asymmetry, agency costs and bankruptcy costs. Therefore, it is maintained assumption of this thesis that property insurance can add value to shareholders by mitigating operating cash flow risks associate with market imperfection.

3. The corporate purchase of property insurance in China is increasingly becoming necessary to satisfy lenders (banks) thereby potentially making leverage endogenous to the insurance decision (Zou and Adams, 2008a; Zou,

2010)[11]. However, as Chinese PLCs are expected to have some bargaining power with lenders in the increasingly competitive domestic lending market, the level of insurance taken out to indemnify lenders against losses arising from bankruptcy will to some degree be negotiable. As such, it is assumed that the overall amount of property insurance taken by the board of Chinese PLCs purchased will still largely be a discretionary strategic decision.

4. Restrictions in the supply of (property) insurance to companies do not severely constrain (distort) the insurance decisions of managers. In view of the rapidly developing insurance market in China and the increasing variety of insurance products and coverage levels on offer (Zou et al., 2003; Zou and Adams, 2006) this assumption is deemed to be reasonable.

5. As in Zou et al. (2003) and Zou and Adams (2006; 2008a) the aggregate level of annual premiums incurred by Chinese PLCs is adjudged to reflect the endogenously derived managerial demand (risk appetite) for indemnity assets coverage rather than the market pricing of risks underwritten in the insurance market. That is, it is assumed that total premiums paid each year reflect the expected probability and quantum of risks to be covered rather than period-specific (cyclical) movements in prices. This assumption is not only consistent with much of the academic insurance literature but deemed to be reasonable as annual amounts of premium are expected to be positively correlated with levels of indemnity coverage (Zou et al., 2003)[12].

6. The financial data to be analyzed derive largely from independently audited public databases. Therefore, the data to be used in this study are assumed to be reliable.

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[11] As noted in section 1.5 above, potential endogeneity issues will be controlled and tested for econometrically using two-stage instrument variable approach.

[12] It is acknowledged that the use of premiums (whilst the only measure available in the current study) is an imprecise ('noisy') indicator of the extent of asset risk protection. This is because premiums can be affected by (unobservable) factors such as the level of deductible retained by the firm and the actual/perceived risk profile of the individual assets insured – a feature that can vary across firms/time and industrial sector (Zou, 2010, p. 971). Additionally, insurance being an *indemnity contract* only covers for *actual* financial loss rather than the current cost of replacement/book (or market) value of the impaired asset. This helps to explain the apparently low percentage spend on property insurance at the 90th percentile noted in panel B of Table 7.1 (see Chapter 7, p. 101).

7. Zou and Xiao (2006, pp. 240-241) note that corporate equity issues are tightly controlled by the Ministry of Finance (MOF) and China Securities Regulatory Commission (CSRC) with approvals only granted if regulatory prescribed profit and investment targets are likely to be met.[13] Investors are nevertheless likely to evaluate companies' risk profiles and impute such assessments into the prices that they are willing to pay for the traded shares. As a result, it is assumed that regulatory constraints on the issue of equity in China should not impact on investors' pricing decisions and the role of insurance in possibly affecting those decisions.

8. Chinese companies' law currently permits insolvent PLCs to declare bankruptcy (although for social welfare reasons this is rare in practice). However, financially weak Chinese PLCs are still likely to suffer the costs of financial distress in ways similar to their counterparts in the West (Zou and Adams, 2008a). Therefore, it is assumed that the probability of bankruptcy and the expected costs of insolvency and financial distress are motives for the corporate purchase of property insurance in China.

9. The insurance data obtained from the CIE/NBSC database are given only at the level of the parent and not for the entire consolidated group. Therefore, the assumption is made that risk-bearing at the parent level is commensurate with that of the group. In other words, it is assumed that the cost of equity at the parent and group level is equivalent, or at least similar.

1.7 Scope of the Project

The scope of the project is defined as follows:

1. The study focuses only on those companies quoted on the Shanghai Stock Exchange (SHSE) and Shenzhen Stock Exchange (SZSE) and excludes those (n = 80 or so) Chinese companies listed on the Hong Kong Stock Exchange (HKSE) and issue A shares. The HKSE has been operating for much longer

[13] For example, profitability has to exceed return on equity targets of 9-10% per annum. See Zou and Xiao (2006, p. 241) for more details of equity issuing requirements relating to Chinese PLCs.

than the mainland bourses and its companies are more closely attuned with Western accounting, risk management, and stock exchange listing practices (Abdel-khalik, Wong and Wu, 1999). Therefore, HKSE quoted companies are excluded to avoid potentially confounding effects.

2. The study focuses on property insurance as it is first, the most significant line of insurance in the Chinese corporate sector (comprising at least 90 percent of the value of total annual corporate premiums – e.g., see the People's Bank of China, 1998, p 123-128; p. 637-638); and second, (tangible) assets-based protection is likely to have the most substantive impact on corporate financing policy and market expectations regarding the surety of future earnings potential (Zou and Adams, 2008a). The insurance of intangible assets (e.g., goodwill) and land are also outside the ambit of the study. The former are not generally insurable in China, whereas land is State-owned and not subject to private damages claims (e.g., arising from pollution) (Zou et al., 2003).

3. The time span of the study covers the five years 2003 – 2007. The main reason for the time period from 2003 to 2007 is due to the data availability of the CIE/NBSC database providing corporate insurance premiums data.

1.8 Outline of the Thesis

The thesis is organized as follows:

Chapter 1. Overview of the Study: This chapter covers the rational for the choice of this research topic, the aim and objectives of the study, the contribution to knowledge, and a description of research methods employed. It also addresses the underlying assumptions and the scope of this study. Finally, an outline of thesis is provided.

Chapter 2. Institutional Background: This chapter provides background information about the institutional environment in which both Chinese PLCs and the domestic insurance market operate. In addition, the institutional merits of Chinese market as a research environment are examined in this chapter.

Chapter 3. Literature Review: This chapter of the research project identifies and reviews (critiques) the literature relating to the corporate demand for insurance. From this review agency theory is selected as the most appropriate conceptual framework within which to guide and direct the empirical analysis.

Chapter 4. Hypotheses Development: This part of the thesis derives and specifies test hypotheses drawn from the agency theory framework outlined in the previous chapter.

Chapter 5. Cost of Equity Capital Metrics: This chapter reviews (critiques) the cost of equity metrics used in prior studies. From this review appropriate metrics are identified to facilitate empirical tests of the selected hypotheses.

Chapter 6. Research Design: This chapter describes the research methods used, including a description of the data, definition of the variables, and specification of models used to analyze the data.

Chapter 7. Empirical Results: This chapter analyzes the results and evaluates them in relation to the test hypotheses and the existing literature.

Chapter 8. Summary and Conclusions: This chapter draws conclusions from the empirical analysis, considers the limitations of the study and outlines the implications of the study's findings for future academic research, and strategic commercial and/or public policymaking.

CHAPTER 2. INSTITUTIONAL BACKGROUND

2.1 Introduction

This chapter provides background information on the institutional environment within which Chinese PLCs operate and sets out the commercial context of insurance in China. More specifically, the chapter outlines the nature of the financial and insurance markets in China and summarizes the key regulatory and legislative frameworks and governance systems within which these financial systems operate. The reasons why China is considered to be an important environment within which to examine the corporate insurance-finance interface are also examined in this section of the thesis.

2.2 Economic Background

With a geographical area of approximately 3.7 million square miles (9.6 million square kilometres) China is territorially the fourth largest country in the world after Russia, Canada, and the US, and currently the world's most populous country with a population of roughly 1.3 billion people (International Monetary Fund (IMF), 2009, 2011). In 1978, China's ruling Communist Party embarked on a program of major market reforms that sought to deregulate State control over major sectors of the economy in an effort to initiate economic growth and foster international trade and investment. These macroeconomic policy goals have largely been achieved as over the last 30 years or so the Chinese economy has consistently achieved annual average rates of Gross Domestic Product (GDP) growth of 7% to 8% per annum exceeding 10% per annum since 2003 (see Table 2.1). Table 2.1 shows that China's GDP has increased from RMB13,582 billion (US$1,641 billion) in 2003 to RMB47,288 billion (roughly US$7,319 billion) in 2011 at current rates of exchange. This makes China the world's second largest economy after the US (IMF, 2011). With a current account surplus in 2011 of approximately US$202 billion, China's rapid growth has been primarily driven by manufacturing exports to mature markets of North America, Japan and Europe (see Table 2.1). This export-led domestic economic growth, together with continuing State management of the economy, has enabled China to avoid the worst excesses of high

unemployment (particularly in urban areas) that have characterized many other transitional economies (Economist Intelligence Unit 2009).

In contrast to many contemporary developing economies, China has also experienced relatively modest price inflation (of less than 6% per annum) over the last five years or so (see Table 2.1) and this relative price stability has helped to stimulate high rates of domestic capital investment and foreign direct investment (FDI) (Economist Intelligence Unit, 2009). Indeed, since the liberalization of trade, relaxation of company ownership restrictions, and greater business freedom induced by China's entry into the World Trade Organization (WTO) (in November, 2001) inward FDI in China has grown rapidly to about US$75 billion as at the end of 2007. This currently makes China the largest recipient of overseas investment in the world ahead of the US (National Bureau of Statistics of China, 2009). Since 1978, the Chinese government has also attempted to minimize job losses arising from privatization and industrial restructuring, and thereby, reduce the risk of extreme social disorder (Zou and Adams, 2006). As noted earlier (chapter 1, section 1.6), this has meant that Chinese companies are rarely liquidated and national unemployment rates have averaged around 4% per annum over the last decade – a rate that has again been much lower than for most other emerging economies over the same period. Since the mid-1990s legal reforms and in particular, the introduction of new property rights legislation-such as China's Companies Law (1993,2005) which amongst other things, established companies as separate legal entities that could own assets-has helped considerably to consolidate and expand economic growth and entrepreneurial activity both nationally and locally (Hasan, Wachtel and Zhou, 2009).

Table 2.1: **China - Key Economic Indicators, 2003-2011**

Economic Indicators		**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
GDP	RMB¥(billion)	13,582	15,988	18,056	21,631	26,581	31,405	34,090	40,151	47,288
	US$(billion)	1,641	1,932	2,257	2,719	3,494	4,522	4,991	5,931	7,319
%annual Δ in real GDP		10.0	10.1	11.3	12.7	14.2	9.6	9.2	10.4	9.3
Current Account Surplus	US$(billion)	43	69	132	232	353	421	243	238	202
	%annual Δ	23	61	91	76	52	19	-42	-2	-15
Foreign Exchange Reserves	US$(billion)	403	610	819	1,066	1,528	1,946	2,399	2,847	3,181
Annual Inflation (Consumer Price)		1.2%	3.9%	1.8%	1.5%	4.8%	5.9%	-0.7%	3.3%	5.4%
Annual Interest Rates	Lending	5.3%	5.6%	5.6%	6.1%	7.5%	5.3%	5.3%	5.8%	6.6%
	Deposit	2.0%	2.3%	2.3%	2.5%	4.1%	2.3%	2.3%	2.8%	2.8%
Unemployment Rate % (Urban)		4.3	4.2	4.2	4.1	4	4.2	4.3	4.1	4.1

(Sources: People's Bank of China (2007-2012); National Bureau of Statistics of China, 2008-2012; IMF, 2009-2011). This table shows the key economic indicators of China from 2003 to2011.

2.3 China's Financial and Insurance Markets

China's financial systems, particularly its equity markets, are playing an increasingly important role in matching the demand for, and supply of, corporate investment funds, fostering entrepreneurial initiatives and promoting domestic economic growth and development (Zou and Adams, 2008a). China's insurance industry, alongside the banking sector, is also playing an important role in the country's current economic progress by mitigating the financial effects of severe unanticipated losses (such as those arising from catastrophic storms, earthquakes, fires and floods), alleviating business uncertainties, and facilitating economic and infrastructural development through institutional investment (Zou, et al, 2003). In this section, the main institutional developments in China's financial and insurance markets are outlined.

2.3.1 Stock Market

Table 2.2 indicates that in 2007 there were just over 1,500 companies quoted on mainland China's two main stock exchanges – Shanghai (SHSE) (established in 1990) and Shenzhen (SZSE) (established in 1991) – with a total market capitalization of approximately RMB32,714 billion (US$4,673 billion). This makes China the most important emerging stock market in the world and one that is likely to continue growing as a result of the economic restructuring of State-owned enterprises (SOEs) and the expansion of the corporate privatization process and growth in the participation rate amongst private investors (with currently 139 million investor accounts – see Table 2.2) (Zou and Xiao, 2006).

Table 2.2: The Chinese Stock Market – Key Aggregate Financial Indicators, 2003-2007

Year	Number of listed companies	Listed share capital (billion shares)	Market capitalization (billion)		Float market capitalization (billion)		Turnover (billion)		Average turnover rate (%)		Average P/E ratio		Investor accounts (10,000)
			RMB ¥	US $	RMB ¥	US $	RMB ¥	US $	**SSE**	**SZE**	**SSE**	**SZE**	
2003	1,285	600	4,246	606.6	1,254	179.1	4,526.1	646.6	250.8	261.2	36.5	36.2	6,953.1
2004	1,373	671	3,705	529.4	1,123	167	4,233.4	604.8	288.7	288.3	24.2	24.6	7218.7
2005	1,378	715	3,243	463.3	1,063	151.9	3,166.3	452.3	274.4	320.6	16.3	16.4	7,336.1
2006	1,421	1,266	8,940	1,277.2	2,501	357.2	9,046.9	1,292.4	555.7	671.3	33.4	33.6	7,854
2007	1,530	1,695	32,714	4,673.4	9,306	1,329.5	46,055.6	6,579.4	936.4	1,062.1	59.2	72.1	13,887

(Source: CSRC (www.circ.gov.cn), Shanghai Stock Exchange (www.sse.com.cn), Shenzhen Stock Exchange (www. szse.cn), People's Bank of China, 2008). These tables give key financial indicators of the Chinese stock market from 2003 to 2007, the period spanning the empirical analysis of the present study.

A key feature of many of China's privatized SOEs is that the government retains significant ownership stake with voting rights scattered amongst various public sector organizations (Zou, Wong, Shum, Xiong and Yan, 2008). Indeed, State ownership represents about one-third of the total number of shares in issue in China and is present in about 90 percent of PLCs – a proportion of State control that is much greater than for domestic corporations operating in former command economies such as those in Eastern Europe (Xu and Wang, 1999). Therefore, as a major equity claimholder in many Chinese PLCs, the State is likely to be a potentially significant loser in the event of a major uninsured loss to productive assets. As a result, it is likely to be in the economic interests of the State as well as private shareholders for Chinese PLCs to purchase property insurance. Another distinctive feature of Chinese PLCs is that ownership tends to be concentrated in a single dominant institutional shareholder (usually these are government agencies or legal entities) that does not trade its equity stake unless it is transferred to a counterparty via private negotiations (subject to government approval) (Chen, Firth and Xu, 2009). This means that although all shareholders have equal voting rights, majority shareholders tend to play a more dominant role in board decisions and matters of corporate governance than their counterparts in Western countries (Chen et al., 2009).

Figure 2.1 shows that A-shares issued by Chinese PLCs are classified into State-held shares, domestic institutional shares (legal-person shares), staff shares and tradable A-shares, with each kind of shareholding accounting for about one-third of total shares issued. In addition, all shares carry the same voting and cash flow rights (Xu and Wang, 1999). State shares are normally held by government agencies (e.g., the Bureau of State Assets Management (BASM)). Legal-person shares are those owned by SOEs, collectively owned enterprises, township and village enterprises, domestic private companies or foreign investors. However, State-held shares and legal-person shares are not publicly tradable (see Table 2.3), and they can only be transferred via private negotiations which are also subject to approval from the MOF and the CSRC (Zou and Adams, 2008b). As a result, there is a potential conflict of interest between non-tradable shareholders and tradable shareholders. This is because non-tradable shareholders' interests are not directly affected by changes in market stock prices given the non-tradability of their shares. More importantly, the concentrated shareholdings can give non-tradable shareholders the opportunity to dominate company decisions and benefit

themselves at the expense of minority interests (e.g., Zou et al., 2008). The potential controlling-minority shareholder incentive conflicts could thus impact on the cost of equity.

Apart from tradable A-shares (mainly comprising private domestic investors), B-shares (traded by foreign investors and since 2001, also by domestic investors), H-shares (shares traded on the Hong Kong Stock Exchange (HKSE)), S-shares (shares traded on the Singapore Exchange (SGX)) and N-shares (shares traded on the New York Stock Exchange (NYSE), NASDAQ Stock Exchange (NASDAQ), or American Stock Exchange (AMEX)) can be transacted on China's bourses (see Table 2.3). The relative volume and value of the different types of shares traded in China between 2003 and 2007 (the year of focus in this study) are illustrated in Table 2.4. In November 2002, China introduced the system of qualified foreign institutional investors (QFII) in an attempt to provide another channel for foreign investors to invest in A-shares and so take advantage of local investment growth opportunities (Zou and Adams, 2008b). Since 2003 the CSRC (established 1998/99) has also actively sought to encourage institutional investors in China – for example, in February 2005 commercial banks were approved to establish fund management companies, while a month later insurance funds entered the stock market (People's Bank of China, 2007). The CSRC supervises and regulates China's securities markets as well as formulating policies, laws and regulations regarding the operation of the domestic financial markets. While both A-shares and B-shares are traded on the SHSE and SZSE (and have equal voting and dividend rights), A-share and B-share markets are different in some key regards. For example, B-shares often trade at a discount to A-shares and are reported to have price lower volatility (Poon, Firth and Fung, 1998). Table 2.4 indicates that in 2007, the total value of shares issued by companies quoted on the SZSE and SHSE was approximately RMB868 billion (US$124 billion). Table 2.4 also shows that of the total number of shares issued by Chinese PLCs roughly two-thirds involved A-share issues reflecting a recent growth in trades conducted by private investors. Moreover, Table 2.4 indicates that share rights issues have become more prevalent in recent years comprising approximately 3% of the total value of equity capital raised in 2007. This observation suggests that Chinese PLCs are eager to raise additional capital to fund future growth opportunities.

Table 2.3: Features of Different Types of Shares in Chinese PLCs

Share types	Shareholders	Tradability
State shares	Various government departments or their delegated bodies (i.e., Bureau of State Assets Management (BSAM) and State assets investing companies)	Not publicly tradable, but may be transferred to domestic institutions upon the approval of the MOF and the CSRC (Article 94 of China's *Securities Law* (1998))
Domestic Institutional shares (Legal person shares)[1]	Corporate investors such as SOEs, non-State-owned companies, financial institutions (other than commercial banks)	Not publicly tradable, but may be sold to other domestic institutions by negotiation outside the stock exchanges upon approval)
Tradable A-shares	Mainly private individuals (and some domestic institutions and securities investment funds, foreign investors through QFII)	Publicly tradable at the SHSE and the SZSE
Staff shares[2]	Company employees and managers	Initially prohibited from trading for one year after allocation, and thereafter, may become tradable A-shares upon approval from the CSRC.
B-shares	Exclusively foreign investors (typically financial institutions) until 2001, from 20th Feb,2001 onwards, private individuals are allowed to trade B-shares on the secondary market	Publicly tradable at the SHSE and the SZSE.
H-shares, N-shares, S-shares	Exclusively foreign investors	Publicly traded in Hong Kong (H-shares), New York (N-shares), and Singapore (S-shares).
Foreign institutional shares	Foreign investors (these are institutional shares procured as founder shares or private placement shares)	Not publicly tradable (founder shares are not allowed to transfer within one year subsequent to the incorporation of the company (Article 143 of the China's *Companies Law* (2005))

(Source: Zou (2002), China Securities Regulatory Commission www.circ.gov.cn, Shanghai Stock Exchange www.sse.com.cn, Shenzhen Stock Exchange www. szse.cn). This table describes the main features of each category of shares that are issued by Chinese PLCs.

Notes:

1. Commercial banks in China are not allowed to hold company shares directly (China's *Commercial Bank Law* (2003) Article 43).

2. The senior management of a company must declare the shares of the company they hold and any changes in them; each year during their term of office they cannot transfer more than 25% of the total of the shares of the company they hold; and they cannot transfer any of the shares of the company they hold within one year after the date the shares of the company are listed and traded. (China's *Company Law* (2005) Article 142).

Table 2.4: The Chinese Stock Market – Type of Share Issues, 2003-2007

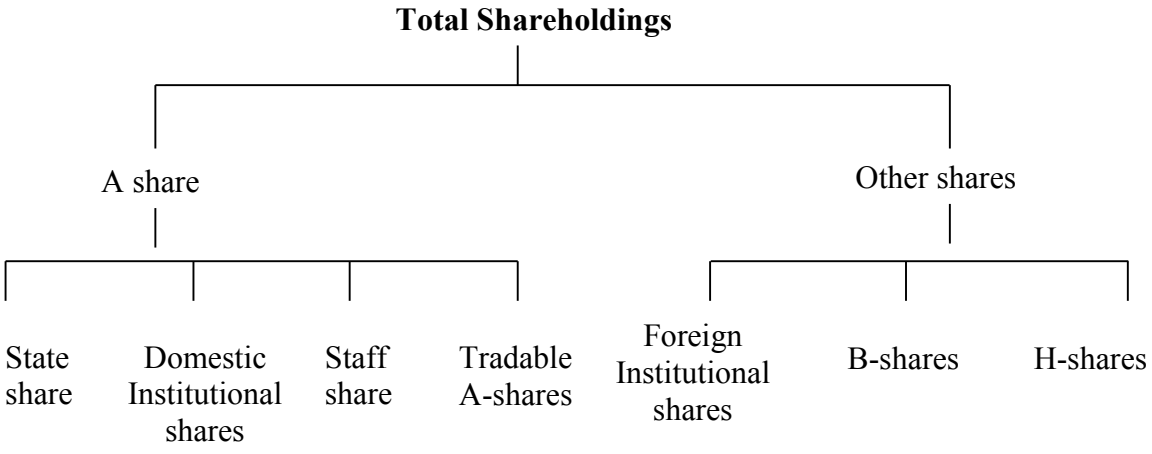
(Unit: 100 millions)

Year	Issued share	In which			Raised Capital		In which							
							A Shares		Rights Issued		H, N Shares		B shares	
		A Shares	H, N Shares	B Shares	RMB ¥	US $	RMB ¥	US $	RMB ¥	US $	RMB ¥	US $	RMB ¥	US $
2003	281.4	83.64	196.79	1.0	1,357.8	194.0	819.6	117.2	74.79	10.7	534.7	76.4	3.54	0.5
2004	227.9	54.9	171.5	1.5	1,510.9	215.8	835.7	119.4	104.5	14.9	648.1	92.6	27.2	3.9
2005	567.1	13.8	553.3	-	1,882.5	268.9	338.1	48.3	2.6	0.4	1,544.4	220.6	-	-
2006	1,287.8	351.1	936.7	-	5,594.3	799.2	2,463.7	352	4.3	0.6	3,130.6	447.2	-	-
2007	637.2	413.3	224	-	8,680.2	1,240	7,723	1,103.3	227.7	32.5	957.2	136.7	-	-

(Source: National Bureau of Statistics of China, 2008). This table provides the number and the value of different types of shares issued in the Chinese stock markets from 2003 to 2007.

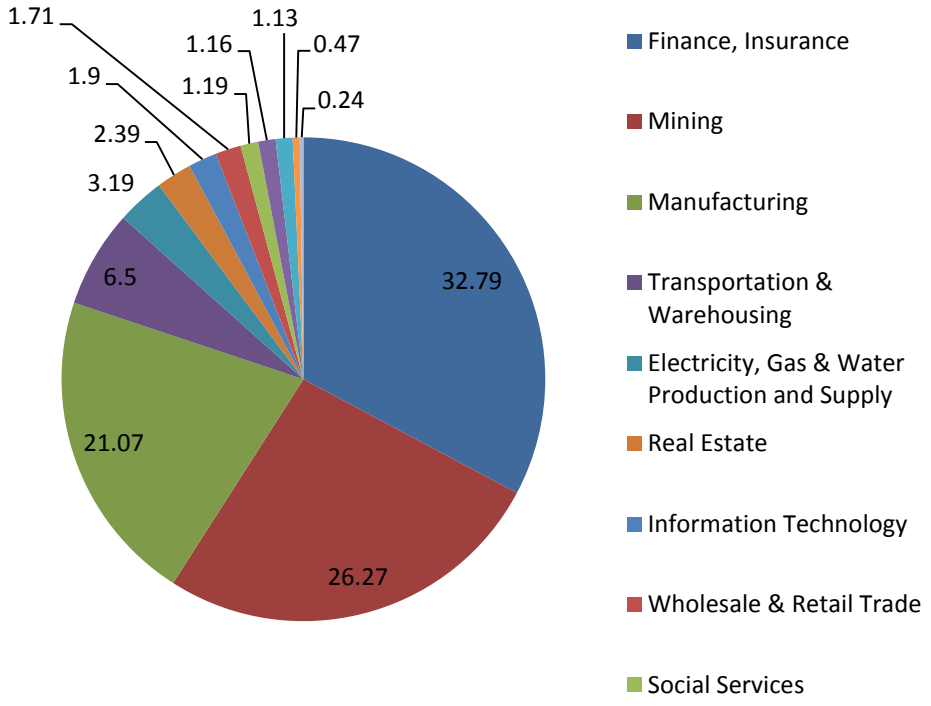
Figure 2.2 gives the industrial sector mix of companies quoted on the Chinese stock exchange in 2007. Figure 2.3 reveals differences in market capitalization by industrial sector between 2003 and 2007. In 2003, most Chinese PLCs (about 44% of total market capitalization) operated in the manufacturing sector. However, by 2007 the proportion of companies operating in manufacturing fell to 21% of total market capitalization, whereas financial services and mining companies have become more significant players on the domestic stock market with 33% and 26% of total market capitalization respectively. These figures therefore suggest that the Chinese economy has undergone major structural changes in recent years.

Figure 2.1:Categories of Shares in the Chinese PLCs



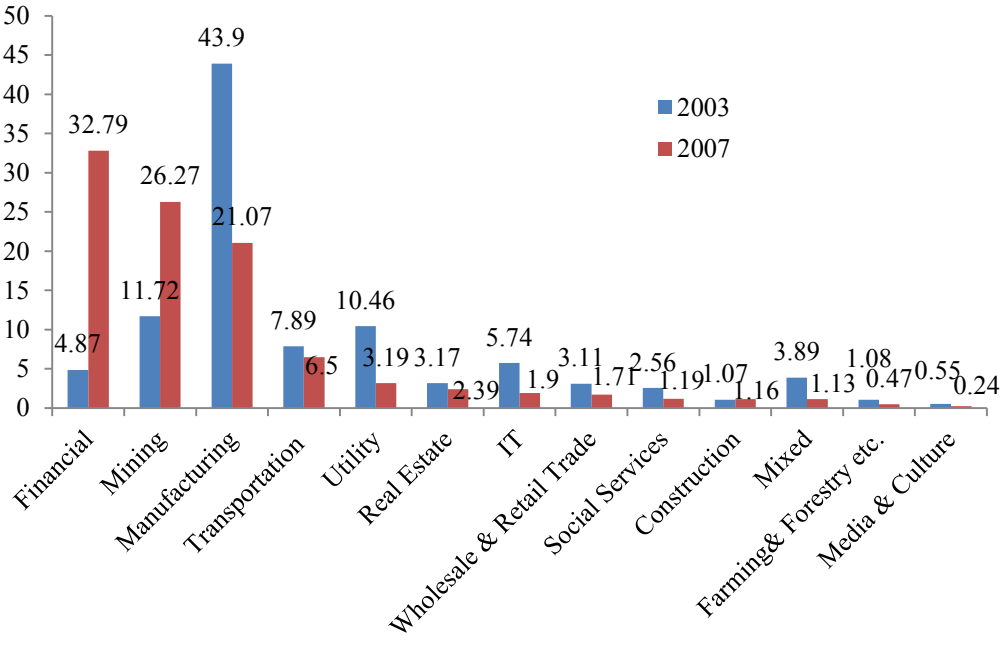
(Source: Derived from various literature sources, e.g., Xu and Wang,1999; Zou and Adams, 2006) This figure illustrates the major categories of shares that are issued by Chinese PLCs-namely, State shares, domestic institutional shares, staff shares, tradable A-shares, foreign institutional shares, B-shares, and H-shares.

Figure 2.2: Market Capitalization by Industrial Sector in 2007



(Source: China Financial Market Development Report, 2007). This figure shows the difference of market capitalization in terms of industrial sector between 2003 and 2007

Figure 2.3: The Comparison of Market Capitalization (%) by Industrial Sector for 2003 and 2007



(Source: People's Bank of China, 2007). This figure shows the difference of market capitalization in terms of industrial sector between 2003 and 2007.

China's stock market is widely recognized to be opaque by Western standards, and that both active and prospective investors often face acute information asymmetry problems as to the future risk and return on invested assets (Xu and Wang, 1999). Therefore, insurance can be important for protecting the economic interests of investors and improving the efficiency of China's capital markets as a source of investment finance by signalling surety to prospective investors as to the security and quality of their investment. To the extent that assets (property) insurance can further help to protect the interests of minority shareholders and other stakeholders such as lenders from business risks like bankruptcy, the adequacy of insurance coverage is also an issue of some importance to the national regulatory authority-the CSRC. Equity finance is expected to grow in importance in China as PLCs are often keen to raise equity rather than debt in order to reduce leverage and relieve the tight monitoring and restrictive credit controls that are often imposed by the banks (Zou and Xiao, 2006). Therefore, the effect of corporate insurance on the equity is likely to be an increasingly important issue for financial analysts and participants in the Chinese stock market.

2.3.2 Corporate Bond Market

In contrast to more advanced economies, such as the UK and the US, China does not currently have a well-developed corporate bond market (People's Bank of China, 2007). The first corporate bonds were issued in China in 1989 and first traded on the SHSE and SZSE from the mid-1990s. A decade or so later corporate bond issues in China only amounted to about RMB102 billion (US$13 billion) or less than 0.5% of GDP (Hasan et al., 2009). The over-the-counter (OTC) corporate bond market in China is even more limited comprising about RMB 4 billion (US$ 0.5 billion) of transactions in 2007(Scott and Ho, 2004). Consequently, there is considerable scope for the Chinese corporate bond market to grow in future in line with national economic development. In contrast, the government bond market (Central Bank and Treasury securities) has witnessed rapid growth in recent years, particularly in short maturity bonds (of a duration of less than a year) with the total value of transactions amounting to approximately RMB8 trillion (US$1 trillion) in 2007 (China Financial Market Development Report, 2007).

Scott and Ho (2004) suggest that there are four main reasons for China's undeveloped corporate bond market. First, in China the corporate bond market has been inherently more risky than commercial banking (e.g., due to acute information asymmetries) – a feature that has manifested itself in several issuer defaults, particularly amongst SOEs. Second, the main issuers of corporate bonds have been Chinese SOEs that have not been financially or legally constrained by corporate liquidation rules. This situation has created an enhanced borrower-related moral hazard problem in the market. Third, the Chinese authorities have viewed it more politically expedient to favor development of the domestic equity markets and so avoid the potential risk of forced corporate takeovers by major creditors in the event default (and the possible impact that this might have on job losses). In these circumstances, State control of the Chinese corporate bond market resides with the People's Bank of China (PBOC). PBOC rules prescribe that, amongst other things, all corporate bond issues have to be guaranteed, interest rates must be capped at 40% over the prevailing bank lending rate, and that approved bond issuances can only be made when the issuer is AAA credit rated. Fourth, corporate incentives to issue bonds have been blunted by a 20% interest tax.

2.3.3 Banking Sector

Given the limitations of China's corporate bond market, it is not surprising that debt finance in the listed company sector is predominately driven by a bank credit, with non-listed firms placing greater reliance on less formal financing channels, such as trade credits, and increasingly, leasing (Ge and Qiu, 2007). The Chinese Central Bank – the PBOC – was founded in 1948 and it performed both central and commercial banking functions up to the market reforms of the late 1970s. Major changes in the Chinese commercial banking sector began in the early to mid-1990s with the separation of policy banks from commercial banks following the passing of the *Commercial Bank Law* (1995) and the encouragement of private sector investment (including direct investment by foreign-owned banks such as Citigroup and HSBC) in the economy via the *Central Bank Law* (1995). Since the mid-1990s the China's banking sector has gone through a process of privatization with four of the largest former State-owned banks now listed entities albeit with the government retaining a majority shareholding. This reform process was further accelerated by China's entry into the WTO with selected

foreign banks (e.g., Citigroup) now licensed to provide commercial banking services to the Chinese corporate sector from 2007 subject to them meeting the minimum capitalization requirement of US10 billion and a capital adequacy ratio of not less than 8% (Berger, Hasan and Zhou, 2009). Developments in China's legal and financial infrastructure, such as the introduction of commercial property rights, ownership privatization, and improved prudential controls over banks' solvency through the monitoring activities of the China Banking Regulatory Commission (CBRC) have further helped to improve systems of financial intermediation, treasury business, and retail banking as well as spawning investment banking activities in areas such as private equity and syndicate loan management. Nevertheless, Berger et al. (2009) report that there is scope for improved operational efficiency in the Chinese banking market – for example, in reducing the incidence of non-performing loans and minimizing risks to collateral underpinning loans granted (e.g., through property insurance). Like other regulatory agencies in China the CBRC is accountable to the PBOC, which as the Central Bank has ultimate responsibility for monetary policy and the regulation of financial markets and financial institutions.

2.3.4 Insurance Market

The real annualized aggregate value of private sector-sourced premiums per capita (i.e., insurance penetration) in China is low (i.e., 1% for non-life insurance and 3% for life insurance) compared with more developed economies such as the UK and US where the average total penetration rate for insurance in the economy is about 8% to 10% (Swiss Re, 2004)[14]. However, since the initiation of the market reform program in 1978, China's insurance market has been growing rapidly in line with its national economic development and the greater autonomy afforded to managers to make business decisions, including commercial insurance purchases (Zou, 2003). With 110 insurance providers operating in China in 2007/8 (including 43 foreign-invested joint-ventures) the supply of life and non-life insurance has grown over the last decade to meet the growth in the demand for commercial insurance.

[14] Insurance penetration is sometimes viewed in the insurance literature as reflecting domestic consumer demand. However, in equilibrium insurance penetration could equally reflect the supply (sales) of insurance in an economy. Therefore, insurance penetration can be viewed as a manifestation of both the demand and supply of insurance in an economy.

Table 2.5: The Chinese Insurance Market – Key Financial Indicators, 2003-2007

Year	Premium income (billion)		Property insurance (%total)	Total assets (billion)	
	RMB ¥	US $		RMB ¥	US $
2003	388.0	55.4	21%	912.2	130.3
2004	431.8	61.7	25%	1185.4	169.3
2005	492.7	70.4	25%	1522.6	217.5
2006	564.1	80.6	27%	1973.1	281.9
2007	703.6	100.5	28%	2900.4	414.3

(Source: People's Bank of China, 2009). This table provides the premium income and total asset of insurance market in China from 2003 to 2008.

Table 2.5 reveals that as at the end of 2007, property-liability insurance premiums in China amounted to approximately RMB197 billion (US$23 billion) (with life insurance premiums totalling about RMB506 billion (US$77 billion). Even allowing for price changes, the current aggregate value of annual premiums written of nearly US$100 billion in 2007 represents exponential growth over the previous two decades when in 1978 total premiums written by the State monopoly – the People's Insurance Company of China (PICC) – amounted to just US$200 million (Thomas, 2002).

Zou and Adams (2006) report that over 85% of their 1997-99 sample of Chinese PLCs purchased property insurance – a proportion that is now likely to be close to 100% as the supply of insurance and awareness risk management awareness of managers has increased in line with the development of the Chinese financial markets. However, at the time that this study was carried out (2003-2007), only about 1% of the value of productive assets-in-place was indemnified by insurance, suggesting a substantial degree of under-insurance and scope for further future growth (Zou, 2010). Growth in the life, health and pensions segments of the Chinese insurance market has also been stimulated by rising real incomes and rates of saving as well as the closure of publicly funded healthcare and pension schemes in SOEs (Swiss Re, 2004). As a proportion of their respective markets, commercial property insurance business currently constitutes roughly 20% of annual premiums and group life insurance about 15% of annual

premiums. Corporate liability insurance is relatively under-developed in China accounting for only 7% of annual premiums (Zou et al., 2003). According to Zheng, Liu and Dickinson (2008), China's non-life insurance sector is projected to grow at a rate of 9% to 13% per annum over the next decade or so, assuming annual rates of growth in GDP of 6% to 9% per annum. This pace of expansion is estimated to be roughly twice that for the international non-life insurance industry as a whole over the same period. In the listed corporate sector almost all companies now insure their productive assets to some extent (Zou, 2010).

Despite increased competition initiated by China's entry into the WTO, the Chinese insurance market is still highly concentrated with approximately 75% annual premiums generated by three main national operators – the PICC, China Pingan, and China Pacific (Sun, 2003; Zou, 2003). The total assets of all Chinese insurance companies has grown from about RMB320 billion (US$41 billion) in 2000 to approximately RMB2,900 billion (US$414 billion) in 2007 (see Table 2.5). Indeed, as noted earlier, insurance companies are now becoming increasingly important institutional investors in the Chinese economy (People's Bank of China, 2007). However, the value of total assets of the Chinese insurance industry only currently comprise roughly 5% of the value of aggregate assets held by the banking sector (National Bureau of Statistics of China, 2009). Since China's accession to the WTO the Chinese market for property reinsurance has also opened up to international reinsurance companies with Lloyd's of London establishing a China-based reinsurance company in 2007(Zheng et.al., 2008)

The China Insurance Regulatory Commission (CIRC) has been the insurance industry regulator since 1998 and it has, amongst other things, responsibility for licensing new (domestic and foreign) entrants to the insurance market, controlling the design of insurance contracts (e.g., policy terms and premium rates), monitoring company solvency, and scrutinizing sales practices, particularly where such practices infringe on the public interest (Zheng et al., 2008). The CIRC inherited most of these duties from its predecessor – the PBOC (to whom it is accountable) - while its statutory authority to create laws, rules and insurance regulations stems from China's *Insurance Law* (1995). This statute gives the CIRC considerable powers of prudential supervision and operational oversight of licensed insurers (which must maintain minimal capital of RMB 200 million (roughly US$25 million)) as well as considerable discretion to

interpret, expand, and enforce legal and regulatory requirements. For example, the CIRC may require an insurer of dubious financial condition to increase its reserves and maintain a solvency margin that is higher than the industry average and/or impose sanctions (e.g., fines, license suspensions and withdrawals) against insurers that do not comply with insurance regulations (Thomas, 2002).

2.3.5 Other Financial Markets

With total annual financial derivatives transactions valued at roughly RMB410 billion (US$51 billion) in 2007 hedging instruments are limited compared with more developed economies such as the UK and US. This means that Chinese corporations are likely to place more reliance on insurance rather than hedging instruments to manage their business risks (Zou and Adams, 2008b, 2009). However, trades on the Shanghai Futures Exchange (SHFE) have been growing in recent years, particularly in commodity futures, interest rate swaps and foreign exchange (forex) forwards, and as such, represents scope for future development (People's Bank of China, 2007). Other market developments in association with the growth of China's banking sector have largely been in commodities trades (notably gold, with an annual trading volume of roughly RMB69 billion (US$9 billion) in 2007) and the inter-bank foreign exchange market (People's Bank of China, 2007).

2.4 Regulatory Framework

China adopts a sector-based regulation model for its financial markets with each sector operating are under separate supervision. Securities, banking, trusts and insurance sectors are supervised by the CSRC, the CBRC and the CIRC respectively.

2.4.1 Regulation of the Chinese Stock Markets

The securities market in China is supervised by the CSRC and companies are not allowed to cross-list between the SHSE and the SZSE. A firm can decide to be listed on either the SZSE or the SHSE, but not both stock exchanges. Before 2001, China

adopted a quota system by setting an annual limit on new share issues (Aharony et al., 2000). Subject to a rigorous and lengthy approval process, many unlisted firms in China acquire a 'shell company' to gain access to the stock markets indirectly (Chi and Ma, 2000). On the other hand, with the absence of an enforceable bankruptcy law and the government's overacting concern with social stability, the authorities are often reluctant to delist or liquidate a poorly performing firm (Xu and Wang, 1999). From March, 2001 onwards, a formal approval system was introduced whereby a firm that wishes to apply for an initial public offering (IPO) would have to be recommended by its sponsor to the CSRC. The CSRC then would review and make the final decision.

2.4.2 Insurance Regulation

China's insurance market has been supervised by the CIRC since the end of 1998. The *Insurance Law* (1995) was adopted to build the basic principle of transacting commercial insurance and was amended in 2002. In essence, the 1995 law acts as the 'mother law' for other insurance related rule-making (Thomas, 2002).

Property insurance prices in China have long been more tightly controlled by the government compared with that of many developed insurance markets (e.g., UK, US) (Wang, 2000). The *Nationwide Insurance Clauses and Premium Rates* (2002), the *Insurance Law* (2002), the *Provisional Ordinance on Insurance Administration* (2003) and the *Clauses, Premium Rates of Property Basic Risks Covers and Property Comprehensive Risks Covers* (2003) are all important laws relating to property insurance pricing. Rates of insurance premium and basic contract terms for the majority of corporate insurance products are controlled by the CIRC under these regulations (Zou and Adams, 2006). Only a limited fluctuation in premium rates (up to a maximum 30 percent) is allowed on intra-provincial business with the CIRC's approval. In addition, the *Clauses, Premium Rates of Property Basic Risks Covers and Property Comprehensive Risks Covers* (2003) cover the classification of insurable hazards and ensure that the scaling of industrial risk basically aligns the risk-rating practices of insurance companies. Moreover, the *Insurance Law* (2002) forbids insurance companies to compete by lowering insurance premiums (Article 106). Chinese insurance companies are also constrained to transfer expected risks to the international reinsurance

market (e.g., they have to give preference to domestic insurer/reinsurers (Article 103)). During the period of analysis (2003-2007), the *Insurance Law* (2002) also required non-life insurers operating in China to cede 20% of annual premiums with reinsurance companies. To sum up, the laws and regulations mentioned above were in effect over the five-year period (2003-2007) covered by the empirical element of this study. Additionally, property insurance prices in the Chinese market were fairly stable in those 5 years therefore avoiding the effects of possible premium level distortions due to extraneous environmental (e.g., regulatory) effects.

2.4.3 Corporate Regulation

China's corporate legal system was originally established in 1993 and has since been amended many times. The most recent one is the *Companies Law* (2005) which sets out general requirements on company incorporation. Specifically, the 2005 Law comprises matters such as corporate governance, the issue, listing and trading of shares, corporate accounting and reporting, dissolution and liquidation. The 2005 Law further divides companies into limited liability company (LLC) and companies limited by shares (joint-stocks companies) company. The former are only allowed to have maximum 50 shareholders and their equity capital cannot be divided into equal shares (Article 3). The latter can be incorporate through a combination of sponsor subscriptions and an IPO (Article 78), while the number of sponsors must more than two but less than two hundred (Article 79). Furthermore, sponsors must subscribe no less than 35 percent of the total shares in issue (Article 85).

China's security law system was established in 1998 with the most recent amendment being made in 2004. The *Security Law* (2004) sets forth the procedures for share issuance, share transactions, information disclosure requirements of PLCs, and the rules of corporate takeover. For example, the *Security Law* (2004) requires a company applying for listing status to report annual net profits for previous three years. Moreover, to align more closely with the *Companies Law* (2005), Chinese PLCs are required to publish regular financial reports at least twice a year (i.e, the interim and annual reports). The annual reports should include a profile of the firm, its audited annual financial statements (e.g., balance sheet, income and cash flow statement),

business review, senior management profile, and the number of outstanding shares and bonds. Chinese PLCs are also required to prepare occasional reports to public, which provides details of expected 'material incidents' that may significantly impact their share prices. Corporate takeovers can take two main forms: bidding purchase or a negotiation purchase. The former is conducted by buying shares through stock exchanges, while the latter involves in a negotiation with the shareholders of the acquired company.

On the other hand, Accounting Standards for Business Entities (ASBE) and 13 industry-specific accounting promulgations were adopted as business accounting rules in China. Local generally accepted accounting practice (Chinese GAAP) was introduced in 1993. (Lin and Chen, 1999). Apart from the ASBE, Chinese PLCs are also required to comply with the Accounting System for Joint-Stock Companies (2002) which is more conservative and closer in format to international accounting standards (IAS). More specifically, from 1997 onwards, corporate disclosure rules in China required PLCs to itemize major financial statement items in the notes to financial statements in annual reports and some companies voluntarily report insurance expenditure under "amortized expense items". However, the rules were changed from 2007 onward, which creates incomparable time-series data, which can adversely confound the analysis of research data including that of the present study. This problem will, however, be dealt with in the process of data collection (see Chapter 6, section 6.2).

2.5 Insurance and Corporate Governance

In 2001/2 the CSRC introduced several new measures for improving the governance of Chinese PLCs including the use of independent board directors (comprising a third of board members with at least one independent director being a professionally qualified accountant), the establishment of nomination, remuneration and audit committees (consisting of a majority of independent directors), and the preparation of annual reports and accounts that confirm to international accounting standards (Yuan, Xiao, Milonas and Zou, 2009). Furthermore, Chinese PLCs operate a two-tier board structure namely a board of directors and a supervisory board (Yuan et al., 2009). However, Xiao, Dahya and Lin (2004) report that the supervisory board is largely symbolic and ineffectual so

that the governance system in Chinese PLCs essentially resembles the single-tier system of Anglo-American companies. In addition, the general lack of risk management expertise and limited risk management alternatives (e.g., with regard to undeveloped local derivatives markets) have increasingly encouraged managers to transfer downside business risks (such as severe catastrophe losses) into the commercial insurance market (Zou, 2003). Corporate governance mechanisms, such as board independence and due diligence, can also enhance the ability of Chinese companies to access bank finance and so exert a significant influence on corporate performance (Firth, Lin, Liu and Wong, 2009).

As an integral part of corporate financing policy and strategy, insurance decisions are also inextricably bound with the decision-making process in Chinese PLCs (Zou and Adams, 2006, 2008a). A major benefit of property insurance is that it helps secure funds for loss recovery and so lowers the insured firm's probability of financial distress and bankruptcy following a major accidental loss. As a result, the heavy costs associated with financial distress and bankruptcy (e.g., costs arising from the violation of debt covenants, the loss of business reputation, and the consequent loss of key customers and business suppliers due to business interruption) can be lowered (Zou and Adams, 2008a). This attribute of corporate insurance may enable firms to reduce their cost of equity capital and maximize value for their shareholders (Shimpi, 2002). There is some empirical evidence supporting the benefits of corporate insurance in China. For example, Zou and Adams (2008a, 2009) find that in China where PLCs rely heavily on private debt (e.g., bank loans) because the issues of equity and bonds are tightly regulated, the purchases of property insurance increase debt capacity and marginally lower interest costs. Zou (2010) shows that more property insurance is associated with a higher traded value for most Chinese PLCs; however, excessive insurance purchases can reduce shareholder value. Zou's (2010) analysis also suggests that a key way for property insurance to increase the market value of companies is that it helps secure debt financing and increase investment activity. Specifically, companies can suffer from agency costs (e.g., in the form of a higher borrowing costs) arising from the debtholder-shareholder incentive conflicts and information asymmetry problems. The presence of appropriate insurance cover thus hedges against liquidity risk by reducing the likelihood of a cash flow shortfall (that may arise from a major accidental loss) forcing a company to scale down or forgo investments in positive NPV projects.

Furthermore, insurance purchases may enhance corporate value and promote good governance by mitigating some internal manager-owner incentive conflicts (Mayers and Smith, 1981, 1982, 1987). For example, managers may be reluctant to invest in positive-NPV loss control and safety projects (e.g., because they focus on short-term profit targets). Insurance may help facilitate such value-adding investment through the insurer's prescription of loss prevention measures (at the time of insurance underwriting). With regard to property insurance, insurers additionally provide "free" and "quality-bonded" safety inspections and loss control advice for their corporate clients (Mayers and Smith, 1981, 1982, 1987). Such risk protection and advisory services can be valuable for Chinese companies that often lack risk management expertise. Therefore, insurance can be an effective internal control device and as such, it is expected to usefully supplement and complement other corporate governance mechanisms in Chinese PLCs (Adams, Chen and Zou, 2011).

2.6 Attributes of the Chinese Environment

China is a potentially good environment within which to investigate the link between corporate insurance and its benefits for shareholders, particularly in reducing the corporate costs of equity capital in at least three regards as follows.

First, the unique institutional and organizational features of the Chinese corporate scene (e.g., the all-pervasive role of the State in corporate affairs and the limited ability of Chinese managers to diversify risks nationally and internationally) combine to make the insurance-cost of equity capital relation an obtuse but nonetheless potentially interesting issue to examine empirically.

Second, the structure of corporate ownership has potentially important implications for corporate governance and understanding financial management decisions (including insurance). Corporate ownership structure reflects owners' control rights and their residual claims to future cash flows generated from productive corporate assets.

Third, in China, property insurance is currently the dominant technique used by PLCs to manage business disruption risks arising from asset losses (Zou, 2003). Therefore, research results are less likely to be confounded by omitted variable bias (e.g., the effect of liability insurance on financing costs) than studies carried out in more developed markets such as the US and UK. Additionally, the availability of alternative risk management techniques such as financial derivative instruments are, as noted earlier, generally limited in China (Zou et al., 2003). Therefore, potentially cleaner empirical tests of the corporate insurance-cost of equity capital relation in China can be carried out than might be the case in more developed markets.

2.7 Summary and Conclusions

This chapter introduces the key features of China's financial and insurance markets and outlines the importance of corporate insurance in alleviating investment risk in the rapidly expanding Chinese economy and maximizing value for shareholders. China is undoubtedly a major international economy and its importance as an insurance and financial market is expected to become more important in the future. Advances have been made in terms of promoting the legislative and regulatory financial infrastructure in China and enhancing systems of corporate governance. However, the Chinese corporate environment is complex and investors, particularly those from overseas, face considerable information asymmetry problems in making efficient and effective capital allocation decisions. Property insurance is an important aspect of corporate strategy in China and empirical research into the insurance-cost of equity capital relation should usefully inform and influence the decision-making process for corporate investors. It is also considered that these attributes will enable a cleaner and more robust test of the research hypotheses to be carried out. The various theories that could help to explain the property insurance-cost of equity relation are reviewed in the next chapter of this thesis.

CHAPTER 3. LITERATURE REVIEW

3.1 Introduction

The academic literature contains numerous theories and hypotheses which purport to explain the corporate purchase of insurance. Collectively, these theories/hypotheses are commonly referred to as financial economics-based (positivist-deductive) theories of insurance. This chapter reviews the main theoretical frameworks that seek to explain corporate insurance (risk management) decisions.

3.2 Theory of Insurance and Risk Management

The major theoretical frameworks used to explain the corporate purchase of insurance are reviewed in this section of the thesis. A summary of their key features, strengths and weakness is provided in Table 3.1.

3.2.1 Expected Utility Theory

An early theoretical framework of the purchase of insurance is expected utility theory. Main (1982) reports that traditionally, optimal insurance decisions have been analyzed in terms of individual risk aversion and expected utility maximization. Essentially, expected utility theory postulates that risk-averse individuals purchase insurance to reduce risk, while risk neutral persons do not have incentives to insure (Arrow, 1971). What is more, the degree of risk aversion will be affected by microeconomic considerations such as the scale of an individual's disposable wealth. However, as expected utility theory is focused at the private rather than corporate level it is largely inappropriate for examining how insurance decisions impact on the market value of firms, particularly those owned by shareholders with balanced portfolios of investments (Cho, 1988, p. 119). Furthermore, it is considered that expected utility theory has limited appeal as a framework for the present study because its underpinning assumptions do not have general application. For example, the notion that corporate owners are risk averse does not have strong empirical support. For instance, intuitively, corporate shareholders (particularly in widely-held corporations) are expected to be

profit-seeking risk-takers, or at least, risk-neutral holders of diversified portfolios (Cummins, 1976). Rather, as Stulz (1984) points out, it is managers who are likely to be risk-averse and thus engage in corporate hedging to satisfy their private welfare objectives (e.g., job security). Indeed, Davidson et al. (1992) provide evidence from the US corporate sector that risk aversion does not motivate shareholders to purchase corporate insurance. Garven (1987) also reports that with expected utility theory it is difficult to determine time and risk preferences among parties in insurance transactions making it very difficult, if not impossible, to derive a collective utility function for risk management decisions. Garvin (1987) adds that expected utility theory is predicated on the notion that risk management (insurance) decisions are focused at the level of the individual whereas firms comprise a nexus of contracts among different constituents such as shareholders, debtholders and managers. Expected utitlity theory is also not explicit as to the extent to which corporate managers will insure their assets in the face of environmental uncertainty and the economic trade-off against other financial strategy goals (e.g., the self-retention of risk).[15] As a result, expected utility and the concept of risk aversion among owners of firms are now deemed by many scholars to be unsatisfactory explanations for the purchase of insurance (Grillet, 1992, p. 462).

3.2.2 Portfolio Theory and the CAPM

Another (efficient markets-based) theory of finance that has been used extensively for analysing corporate risk is portfolio theory (Markowitz, 1952). This framework encompasses the CAPM (Sharpe, 1964; Linter, 1965) [16] and is consistent with Modigliani and Miller's (1958) seminal work on corporate capital structure, which posits that in perfectly competitive markets (e.g., those without transaction costs and taxes) financing policy (including the insurance decision) does not affect the market

[15] Froot et al. (1993, p. 1632) state that the transaction costs of hedging will, at least partially, determin the optimal hedging position of companies and explain why the managers of firms will not in reality hedge all business risks.

[16] The CAPM is commonly used to estimate the expected equity cost of capital (r) for a $firm_i$ (Botosan, 1997, 2000, 2006) and a single period model that is also founded on notions of efficient markets, risk-less borrowing, zero transaction costs, and absent taxes (Main, 1982, p. 7). The CAPM has been widely criticized in the literature for not explaining expected security returns sufficiently accurately using short time series data on realized security returns (e.g., see Fama and French, 1992; Lee et al., 2006). See Chapter 5 (section 5.2.1) for a detailed evaluation of the CAPM as a cost of equity metric.

value of a firm (Jensen and Smith, 1985)[17]. In other words, in perfectly competitive and efficient markets with costless bankruptcy, the risk-adjusted NPV of the corporate insurance decision is zero (Cummins, 1976; MacMinn and Garven, 2000). Portfolio theory defines an efficient asset portfolio as one that provides both the maximum expected return for a given risk (variance) and minimum risk for a given expected return (Jensen and Smith, 1985, p. 5). This 'mean-variance principle' implies that decision-makers can estimate the outcomes and probabilities of investment choices and so the more risk reduced through diversification the greater the total value of the portfolio (Doherty, 2000, p. 551). This reasoning suggests that risk management decisions (such as insurance) can be viewed as a portfolio optimization strategy such that the maximization of firm value becomes a trade-off between risk transfer (purchasing insurance) and risk retention (capital maintenance). However, a key limitation of portfolio theory is that variance is a crude measure for the cost of risk and that other financial factors (e.g., leverage) are likely to have a more direct impact on the cost of risk, level of capital retained, and market value of the firm (Doherty, 2000, p. 551).

The CAPM has been widely used in asset-risk pricing and estimating the cost of equity capital (Jensen and Smith, 1985; Cassidy et al., 1990; Pagano, 2001). However, the basic insight of the CAPM is that the market value of a widely-held firm is affected only by non-diversifiable systematic (market-based) risks because firm-specific (idiosyncratic) risks (e.g., arising from fire damage) can be efficiently diversified by shareholders holding balanced portfolios of investments. Therefore, at equilibrium, only systematic risk (beta) is taken into account by the market in the pricing (valuation) of a firm's shares (assets) (Poshakwale and Courtis, 2005). This implies that for well-diversified shareholders the purchase of insurance is not a value maximizing activity and (e.g., because of transaction costs) the purchase of insurance could actually reduce firm value (Main, 1982, p. 7). In other words, portfolio theory (including the CAPM) and Modigiliani and Miller's (1958) generalized 'irrelevance theorem' imply that the cost of capital and insurance are mutually independent. That is, under conditions of

[17] In a later paper, Modiglian and Miller (1963) showed that where the assumtptions of perfect markets and information asymmetry are eased and interest expenses become tax deductible then the financing method (including by implication, insurance) can be value enhancing for shareholders. Therefore, a firm's optimal capital structure (and hence optimal cost of capital position) will involve a trade-off between increased bankruptcy risk arising from increased indebtedness and the tax shield advantage of deducting debt costs against future taxes (Merton, 1987; Merton and Perold, 1993). As insurance helps to mitigate bankruptcy risk and is also tax deductible against earnings, it is also likely to be an important consideration in determining a firm' optimal capital structure and cost of capital (Shimpi, 2002).

capital market equilibrium, insurance does not reduce the risk of investors' returns and so cannot effectively lower the cost of capital and maximize the traded value of firms (Doherty and Tinic, 1981, p. 950). Prior US studies (e.g., Cummins and Harrington, 1985; Davidson et al., 1992) have used the CAPM to examine the relation between systematic risk and insurable losses using aggregate property-liability insurance companies' data and found that insurance does not statistically affect underwriting betas and hence the cost of equity.

Main (1982, p.10) nonetheless reports that despite the implication that insurance does not add value for shareholders holding balanced portfolios of investments, corporate insurance purchases are common in practice, even amongst large and widely-held corporations (e.g., see also Yamori, 1999). This could reflect the economic benefits of transferring firm-specific risks to a third party insurer which has comparative advantages in risk-pooling and claims settlement, and can also provide its corporate clients real services in the form of loss prevention advice, legal support services and so on (Grillet, 1992). O'Brien (2006, p. 105) adds that business practitioners often consider that managing idiosyncratic risk (e.g., using property insurance) can add value for shareholders by reducing uncertainty over the variability of future cash flows and mitigating the cost of risks (e.g., agency and bankruptcy costs) which arise from market imperfections.

3.2.3 Options Theory

Options theory posits that corporate risk management strategies, such as the purchase of insurance, are contingent on the value of underlying assets whose value varies according to their price/risk (volatility), the risk-free rate of return, exercise price, and time to maturity (Rubinstein, 1976; Cox, Ross and Rubinstein, 1979). Therefore, in a highly levered firm with limited liability (i.e., a 'default put option') the value of equity could be viewed as a (call) option on firm value with an exercise price equal to the face value of debt. If asset values fall below the face value of outstanding debt (which might happen following an unexpectedly severe uninsured loss event which causes financial distress) then shareholders could be motivated to exercise their default put option and 'walk away' from their investment in the firm. This can impose significant externality

costs on society as well as shifting the risks of financial distress and bankruptcy onto the firm's fixed claimants (e.g., debtholders) (Grillet, 1992)[18]. Doherty (2000) contends that options theory can be applied to insurance transactions as contractually insurance claims are contingent upon the occurrence of insured events. Under the options framework, shareholders, for example, have incentives to maximize risks (i.e., their default put option value), while debtholders are motivated to minimize risks by requiring insurance to be taken out on collaterized assets thereby helping to reduce the cost of debt. However, Pagano (2001) suggests that hedging (insuring) assets could be viewed as a risk management cost to investors as it reduces the value of their default put option to abandon the firm in the event of financial distress. The main conceptual appeal of options theory is that it assumes that the value of underlying assets (e.g., shares) can be measured with a degree of certainty (as in efficient markets). However, Doherty (2000, p. 189) points out that options theory has its limitations for pricing insurance as the relative probability distributions that underpin insured losses and changes in share prices are likely to differ between firms. Therefore, options theory has limited application in the context of the present study as the underlying asset portfolios of many Chinese PLCs will be difficult to value accurately from the published information available.

3.2.4 Strategic Competitive Theory

Strategic competitive theory argues that the managers of risk neutral firms can be motivated to purchase insurance as a result of strategic product-market considerations. Indeed, prior research (e.g., Mayers and Smith, 1982; Zou and Adams, 2006; Jia, Adams and Buckle, 2010) report that insurance decisions are strategically important to businesses. In this vein, Ashby and Diacon (1998) consider optimal insurance coverage in oligopoly (duopoly) firms under conditions of a Cournot-Nash game. They postulate that given market uncertainty, managers have incentives to maintain market equilibrium levels of insurance in order to protect and maintain their share of abnormal economic rents arising from the exercise of oligopoly power (i.e., high prices, fixed (low) outputs) following an unforeseen catastrophic loss event (e.g., a severe earthquake). Ashby and

[18] The upside of limited liability is that it eliminates the unrestricted dependence of firm credit on shareholders' wealth and reduces the transaction and information costs for owners when considering potentially risky and uncertain business investments (Grillet, 1992, p. 463).

Diacon (1998) argue that with differential market levels of insurance coverage highly insured firms would benefit strategically at the expense of lowly insured firms following a major event loss thus breaking down the oligopoly. Seog (2006) takes a different view and contends that in competitive markets insurance can encourage corporate managers to act aggressively with their rivals (e.g., by increasing output and/or lowering prices) when the strategic benefits (e.g., in terms of new business acquisition) are greater than the cost of insurance. That is, reducing period cash flows might increase financial distress costs for the lowly insured firm while the highly insured firm could mitigate the effects of financial distress by insuring its (collaterized) assets. Seog's (2006) reasoning therefore implies that insurance could enhance rather than mitigate managerial risk-taking via aggressive price reducing/output increasing behavior in highly competitive markets, and that managers in aggressive (fast-growing) firms will have incentives to purchase insurance since their operating and investment decisions increase the degree of future risk and uncertainty.

Indjejikian (2007) further points out that cost of capital decisions can be strategic if (as argued in Lambert, Leuz and Verrecchia (2007)) public information disclosures (on matters such as a firm's risk profile) affect the cost of capital of other market participants. However, the main shortcomings with regard to strategic competitive theory relate to the difficulty in measuring the largely unobservable strategic financial impact of property insurance on market output, and ascertaining whether managers purchase insurance before or after they make their output decisions. The linkage between the strategic effect of insurance, the cost of insurance and the cost of equity capital are also not made explicit in the literature. These limitations thus reduce the conceptual and empirical appeal of strategic competitive theory in the context of the present study.

3.2.5 Signalling Theory

Signalling theory underpins much of the literature on the effect of accounting (financial) disclosures on the cost of capital (e.g., see Botosan, 1997, 2000; Botosan and Plumlee, 2002, 2005). Signalling theory explicitly recognizes that there are information asymmetries between managers (insiders) and prospective investors (outsiders) with the former possessing private information (e.g., regarding future investment opportunities)

that the latter does not have (Ross, 1977). Signalling theory posits that to mitigate information asymmetry problems and highlight a firm's growth prospects, managers will be motivated to signal inside information (e.g., risk mitigation strategies) publicly but at the same time take care not to disclose potentially costly proprietary information (Talmor, 1981; Botosan, 2000).

Grace and Rebello (1993) contend that insurance can be used by managers with private information on expected cash flows/insured losses to signal the 'quality' of the firm to financial markets, and so increase its future cash flow generating ability. Insurance decisions can therefore help to consolidate diverse information among investors and assure their perceptions about a firm's market prospects. This reasoning is analogous to Easley and O'Hara's (2004) proposition that improving the quality of information disclosure reduces the cost of capital by 'levelling the playing field' for investors. Main (1982) also suggests that management might use the extent of (productive assets-based) insurance coverage to signal their financial expertise and prudence to the market (thereby enhancing their human capital value in the managerial job market). This positive signalling effect could help firms to acquire and retain customers, and thus secure competitive advantages in the market (Seog, 2006). Pagano (2001) contends that publicly disclosing hedging activities (such as insurance) further enables managers to signal anticipated improvements in the distribution of firms' cash flows (e.g., it could indicate that managers are confident about having sufficient liquidity to pay future insurance premiums). As a result, a firm's 'true' risk profile (i.e., the degree of managerial confidence regarding future payoffs on assets) can be revealed to financial markets through the corporate purchase of property insurance.

In nascent but highly uncertain developing markets, such as China, signalling theory might help to explain the disclosure of insurance details to the business community either formally (e.g., through published accounting statements) and/or informally (e.g., via private communication channels) so as to signal the underlying economic value of the firm to prospective investors. However, Brennan (1995, p. 13) reports that signalling theory has its limitations; for example, it does not explain why one mode of disclosure is likely to be chosen over another. Nikolaev and Van Lent (2005, pp. 678-680) and Botosan (2006, p. 37) also claim that modelling managerial disclosure signals can be difficult because of problems such as variable endogeneity and sample selection bias.

For example, managers may voluntarily disclose insurance purchases because their firms are inherently low risk entities with low costs of capital. Therefore, a theoretical framework, such as agency theory, that focuses on the volume of, rather than the public disclosure of, corporate insurance purchases could offer better insights into the link between insurance and the cost of capital.

3.2.6 Transaction Cost Economics (TCE) Theory

TCE theory predicts that risk management practices (such as insurance) are determined by institutional economic factors such as accepted market practices and norms of business behavior. Therefore, in emerging markets (such as China) managers are expected to use insurance as they become more familiar with the need manage corporate risks and institutional structures (e.g., financial and legal) develop to satisfy demand for insurance (hedging) techniques (Klimczak, 2008). Moreover, as with agency theory, TCE theory holds that firms are characterized by the twin problems of bounded rationality (incomplete and costly contracting) and managerial opportunism (self-seeking behavior), and that cost-effective contractual commitment can be facilitated through the purchase of transaction-specific assets (Adams, 1997)[19]. By linking the certainty of contractual exchange with specific asset purchases, insurance help to promote the security of business transactions (Klimczak, 2008). However, in emerging markets such as China there are few historical and institutional determinants of the current state of risk management (insurance) practices compared with more developed economies such as the UK and US. In addition, there are few direct empirical tests of the predictions of new institutional economics theory in the risk management literature (e.g., see Klimczak, 2008). These constraints therefore limit the conceptual appeal of TCE theory as a framework for testing the insurance-cost of capital relation in the Chinese corporate sector.

3.2.7 Agency Theory

Agency theory derives originally from the risk economics/insurance literature which describes the risk-sharing problems (e.g., adverse selection and moral hazard) arising

[19] Adams (1997) reports that transaction-specific assets can be physical in nature (e.g., specialist machinery) and/or human-specific (e.g., the specialist insurance knowledge of actuaries).

when cooperating parties have different attitudes towards risk. It has been broadened in the finance literature to include agency problems occurring when cooperating parties have different goals and incentives (Jensen and Meckling, 1976; Ross, 1973). Specifically, it focuses on the agency relationships within a corporation and is concerned with resolving problems that can occur in agency relationships. Jensen and Meckling (1976) postulate that the key agency theory holds that the modern corporation can be viewed as a 'nexus of contracts', which exist to ensure that agents (managers) act in ways that maximize the economic interests of shareholders (principals) and other constituents (e.g., debtholders). However, this plurality of contracts that comprise the modern firm generates non-trivial monitoring and control costs that may be exacerbated by unexpectedly acute asset losses (Grillet, 1992, p. 466). In other words, agency problems arise when the goals or incentives between two parties are different, and it is difficult and/or expensive to verify that one party (agent) behaves in line with the interest of another party (principal). Another issue is the risk-sharing problem that arises when two parties have different attitudes towards risk. In a typical PLC, there are three main types of agency relationships: (1) manager and shareholders; (2) shareholders and debtholders; (3) controlling shareholders and minority shareholders. As noted previously, the agency problems arising from these three agency relationships are summarized in the Table 3.2.

The basic assumptions of agency theory include imperfect markets (e.g., financial costs) and information asymmetries (e.g., adverse selection and moral hazard). Agency theory holds that in the face of information asymmetries, and the costs arising from agency problems and other risks such as the probability of bankruptcy, market investors and debt providers will impute a higher price for the enhanced risk of unforeseen and acute asset losses thus increasing the firm's cost of capital (Cornell and Shapiro, 1987). However, by alleviating the costs of risk and reducing the need for costly contracting and monitoring by capital providers property insurance can play an important role in reducing a firm's cost of capital (Shimpi, 2002; O'Brien, 2006).

Agency theory-based arguments for the corporate purchase of insurance are reported extensively in the academic literature (e.g., see Mayers and Smith, 1981, 1982, 1987; MacMinn, 1987; Zou et al., 2003; Zou and Adams, 2006, 2008a; Jiang, Adams and Jia-Upreti, 2012). Indeed, Garven (1987) suggests that agency theory is the most prevalent

theoretical framework used in insurance research including studies conducted using Chinese corporate data (e.g., Zou et al., 2003; Zou and Adams, 2006,2008a; Jiang et al., 2012), Mayers and Smith (1981, 1982, 1987) view insurance as an integral part of corporate financing policy and they contend that given imperfect market conditions, insurance enables managers of firms to mitigate agency problems (e.g., the underinvestment and asset substitution problems)[20] and limit short-term risky behavior. Table 3.2 illustrates the main agency problems in firms and how (property) insurance can mitigate those problems, and in doing so, help reduce the equity costs of capital.

Davidson et al. (1992) find that in the US corporate sector the primary motivation for the corporate purchase of insurance are the 'me-first rules' contained in debt covenants and that in return for insurance on collaterized assets, debtholders charge a lower cost of debt thereby increasing value for shareholders. Caillud, Dionne and Jullien (2000) also show that the cost of agency and other (e.g., bankruptcy) risks associated with external financing can induce risk-neutral investors to insure (hedge) against asset losses. This is because the managers of firms are likely to have better information than outside capital suppliers concerning the future timing and magnitude of accidental losses and so they are likely to require property insurance to be purchased to mitigate such risk exposures. In this regard, property insurance could also effectively substitute for other potentially costly contracting solutions to the information asymmetry problem such as regular

[20] With regard to the underinvestment problem, Mayers and Smith (1987), MacMinn (1987), Garven and MacMinn (1993), and MacMinn and Garven (2000) demonstrate analytically that in highly levered states (with risky outstanding debt) an acute loss event could motivate shareholders not to replace (or fully reinstate) damaged/lost assets because the economic gains would accrue to debtholders rather than themselves. MacMinn and Garven (2000, p. 551) also report that the underinvestment incentive can arise by shareholders/managers limiting the size of restatement as well as rejecting the replacement compeletly. In such circumstances, shareholders would (under corporate limited liability rules) liquidate the company leaving debtholders with unrecoverable losses (i.e., the so-called 'debt over-hang' effect). However, insurance is a key contracting mechanism that can mitigate the underinvestment incentive by providing post-loss financing for the assets destroyed/impaired by an insured loss event. This analysis implies that more highly levered firms are more likely to insure (hedge) than firms that are less indebted (Nance, Smith and Smithson, 1993, p. 269). Campbell and Kracow (1990) analyze the asset substitution (risk-shifting) problem and they argue that risk management (such as insurance) can control the incentives of shareholders/managers to increase asset risk after financing terms have been agreed with debtholders. For example, risk-shifting can be controlled by the terms and conditions of insurance policies and the monitoring activities of insurance companies' inspectors (Ashby and Diacon, 1998, p. 37). Therefore, loan covenants often specify that collaterized assets over which the lender has a claim should be insured (at the borrower's expense) in order to minimize the risk that after a loan has been granted the borrower increases the risk associated with those assets by, for example, engaging in speculative ventures. Davidson et al. (1992) also make the insightful point that lenders would prefer insurance coverage under the 'me-first' rules of debt covenants rather than price the risk via higher interest charges because bankruptcy could result in uninsured losses.

independent auditing. Froot et al. (1993) and Doherty (2000) argue that insurance (hedging) helps ensure investment goals and realized after an unexpectedly severe loss event and in doing so, mitigates agency costs arising from lax risk management and managerial inertia. That is, insurance resolves that so called 'investment crowding-out' problem (see Table 3.2 and Chapter 4, section 4.2) These attributes of insurance further helps to maximize the long-term market value of the firm by exploiting more fully the 'quasi rents' that can be realized by using organizational capital effectively (Grillet, 1992, p. 467). MacMinn and Garven (2000) also report that because of market imperfections (e.g., bankruptcy costs) insurance can provide an optimal hedge for firms as it alters the payoff distribution for investors in a way that they cannot duplicate on their personal account. This view is consistent with the well-known Fisher separation theorem in finance (Fisher, 1930) and implies that in an economy with costly bankruptcy the market value of an (highly) insured firm is expected to be greater (cost of capital lower) than for an uninsured (lowly insured) firm, other things being equal. Additionally insurance can encourage managers to take risks and thus add value for shareholders. For example, insurance can assure managers that their economic interests (e.g., job security) are protected from downside risks of decisions taken. By providing surety to managers, insurance can optimize the effect of incentive compensation schemes and so better align the interests of managers with the objective of maximizing shareholder value. These qualities help reduce the equity cost of capital by mitigating problems associated with managerial entrenchment (e.g., see Jiang et al., 2012) (see also Table 3.2).

Given the widespread use of agency theory in the finance and insurance literature, and the ability of insurance to influence the cost of capital, agency theory is considered to be the most apt theoretical framework for the present study. Agency theory is also appropriate as theoretical framework as insurance is a key contractual mechanism for mitigating the potential value-diluting effect of agency costs (e.g., arising from managerial entrenchment and moral hazard), and other risks (e.g., financial distress/ bankruptcy risks following unexpectedly severe losses to productive assets). Again, as noted earlier, the key agency problems that can arise between managers and different capital providers in the modern corporation and how those problems might be mitigated

by insurance as well as the implications for the cost of equity are summarized in Table 3.2[21].

3.3 Summary and Conclusions

This chapter reviews critically seven main financial economics-based theories – expected utility theory, portfolio theory/CAMP, options theory, strategic competitive theory, signally theory, TCE theory and agency theory. Each conceptual framework has been used in the academic literature to explain why large and diversified companies insure their assets[22]. Each of theory rests on the notion that risk management practices (including insurance) arise because of market failures such as information asymmetry problems, agency incentive conflicts and the costs of financial distress and bankruptcy[23].

Expected utility theory postulates that risk-averse individuals purchase insurance to reduce risks. However, it could not explain the behavior of corporate insurance purchases. Portfolio theory suggests that risk management decisions such as insurance can be viewed as a portfolio optimaization strategy. In this sense, the maximization of firm value becomes a trade-off between risk transfer (insurance) and risk retention (capital maintenance). However, the CAPM implies that for well-diversified shareholders the purchase of insurance is not a value maximizing activity and that the purchase of insurance could actually reduce firm value. Option theory views the value

[21]Chinese PLCs with a concentrated ownership structure are usually dominated by large (state-owned) shareholders. As Table 3.2 illustrates, the main agency problem under such structure is the expropriation (tunnelling) of minority interests by controlling (block) shareholders. The problem is further exacerbated in China as the coexistence of non-tradable shares held by controlling shareholders and tradable shares held by minority shareholders(though both types of shares have equal cash flow and voting rights under Chinese corporate law) (e.g., see Zou et al., 2008)

[22] Conceptual frameworks drawn from outside the financial economics discipline such as contingency theory (e.g., Baird and Thomas, 1985) and stakeholder theory (e.g., Cornell and Shapiro, 1987) have been used in the organization and management literature to examine corporate risk management decisions. However, these theories are considered to be outside the scope of this study as they tend to encompass non-economics-based (e.g., organizational/behavioral and institutional social policy) explanations for managerial hedging.

[23] Mayers and Smith (1982) report that tax considerations could also motivate the corporate demand for insurance. They point out that given convex (progressive) tax schedules (e.g., due to tax loss carry-forward provisions) insurance can help to reduce the volatility of future annual earnings and so reduce a firm's expected taxes. Taxes can also affect the WACC (Lee et al., 2006). However, the non-progressive nature of taxes in China implies that tax-based motives for insurance are unlikely to be significant.

of equity as a call option in a levered firm with limited liability. Doherty (2000) points out that options theory has limitations for pricing insurance as the relative probability distributions that underpin insured losses and changes in share prices are likely to differ between firms. Strategic competitive theory argues that the managers of risk neutral firms can be motivated to purchase insurance as a result of strategic product-market considerations such as the ability to grow market share. The main shortcomings regarding strategic competitive theory relate to the difficulty in measuring the largely unobservable strategic financial impact of property insurance on market output, and ascertaining whether managers purchase insurance before or after they make their output decisions. The linkage between the strategic effect of insurance, the cost of insurance and the cost of capital are also not made explicit in the literature. Signalling theory underpins much of the academic literature on the effect of accounting financial disclosures on the cost of capital. However, it is difficult to model managerial disclosure signals due to potential variable endogeneity and sample selection bias. TCE theory predicts that risk management practices are determined by institutional factors such as accepted market practices and norms of business behavior. However, in emerging markets such as china there are few historical and institutional determinants of the current state of risk management practices as they are in more developed economies such as UK and US. Agency theory views insurance as an integral part of corporate financing policy and it contends that given imperfect market conditions, insurance enables firms to reduce the costs by mitigating agency problems. Insurance also ensures that strategic investment opportunities will be met by reducing the volatility of future cash flows, and thereby lowering the cost of equity of firms. Moreover, agency theory is the most common theoretical framework used insurance research, including studies using data from the Chinese corporate sector. Therefore, agency theory is selected as the most appropriate theoretical framework from which to derive the research hypotheses used in this study. These research hypotheses are developed and put forward in the following chapter of this thesis.

Table 3.1: **Summary of Theories of Insurance**

Theory	Proponents	Main Features	Key Assumptions	Rationale for Insurance	Major Criticisms
Expected Utility Theory	• Arrow (1971)	• Utility maximization • Risk aversion	• Positive marginal utility	• Insurance protects economic interests (utility) of decision-makers	• Focuses on individuals not corporate level
Portfolio Theory and CAPM	• Sharpe (1964) • Lintner (1965)	• Financing policy does not affect firm value	• Asset returns are normally distributed • Aim is to maximize economic utility of investors	• Maximization of firm value becomes a trade-off between risk transfer (purchasing insurance) and risk retention(capital maintenance)	• Variance is a crude measure of risk • It does not account for the social or personal dimensions of investment decisions
Options Theory	• Cox, et al. (1979)	• Value of equity could be viewed as a (call) option with an exercise price equal to the face value of debt	• Levered companies • Efficient markets • Value of underlying assets can be measured	• Insurance claims are contingent upon the occurrence of insured events	• Difficult to price insurance (probability distributions are likely to differ across firms)
Strategic Competitive Theory	• Ashby and Diacon (1998)	• Insurance purchases as a result of strategic product-market considerations	• Applies to oligopoly (duopoly) and/or competitive markets • Market equilibrium exists and therefore induces optimal insurance buying	• Managers maintain market equilibrium levels of insurance to protect their share of abnormal economic rents after an unforeseen catastrophe	• Difficult to measure the largely unobservable strategic financial impact of insurance before and/or after companies make their output decisions

(Continued)

Theory	Proponents	Main Features	Key Assumptions	Rationale for Insurance	Major Criticisms
Signalling Theory	• Grace and Rebello (1993) • Botosan (1997, 2000)	• Underpins much of the literature on the effect of accounting disclosures on the cost of capital	• Market reacts to new information • Rational behaviour of stakeholders	• Publicly disclosing hedging activities such as insurance enables managers to signal anticipated improvements in the distribution of firms' cash flows	• It does not explain why one mode of disclosure is likely to be chosen over another • Endogeneity and sample selection bias
TCE Theory	• Klimczak (2008)	• Risk management practices (such as insurance) are determined by institutional factors such as norms of business behavior	• Incomplete and costly contracting • Managerial opportunism	• By linking the certainty of contractual exchange with specific asset purchases, insurance help to promote the security of transactions	• In China there are few historical and institutional determinants of the current state of insurance practices
Agency Theory	• Jensen and Meckling (1976) • Mayers and Smith (1982)	• Incentive conflicts between contracting groups • Conflict control through contracts	• Inefficient markets • Information asymmetries • Transaction costs (taxation, bankruptcy costs etc.)	• Monitoring and bonding role of insurance thereby mitigating agency problems and reducing cost of capital	• May be difficult to establish causal relationships between the phenomena being explained and conceptual parameters

(Source: Derived from various studies).This table summarizes financial economics-based (positivist-deductive theories) have been reported in the literature to explain the corporate purchase of (property) insurance.

Table 3.2: **Property Insurance and the Mitigation of Agency Incentive Conflicts and Information Problems in Firms**

Agency Problem	Features	Effect of Insurance	Impact on Cost of Equity	Relevant Study
Underinvestment (between shareholders and debtholders)	Arises when shareholders, particularly in highly levered firms, decline to reinvest in assets lost or impaired by an unanticipated catastrophic event because the gains from reinvestment are likely to accrue to debtholders rather than themselves. Therefore, shareholders exercise their 'default put option' under limited liability rules and 'walk away' from the firm.	Insurance enables lost or impaired assets to be replaced or repaired without the need for new equity, debt or use of cash. Thus, the firm can return to being a 'going concern', so protecting the claims of debt-holders and other contracting constituents such as employees and minority investors.	The cost of equity could be reduced by assuring prospective investors and minority investors that the firm is a going concern.	MacMinn (1987)
Asset Substitution (between shareholders and debtholders)	Again this agency problem particularly arises in highly levered firms. It occurs when shareholders seek to promote their returns at the expense of debt holders fixed claims by ex-post shifting firm risk by moving investments from precautionary to risky projects. This potential risk-shifting problem is anticipated by debtholders who increase rates of interest on loans.	Insurance of collateralized assets enables debtholders' payoffs to become relatively independent of project selection thus alleviating the risk of asset substitution and minimizing wealth transfers from debtholders to shareholders.	The cost of equity could be reduced by assuring prospective investors and minority investors that the firm is a 'going concern'.	MacMinn (1987)

(Continued)

Agency Problem	Features	Effect of Insurance	Impact on Cost of Equity	Relevant Study

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Overinvestment (between managers and shareholders)	This problem can arise where shareholders and/or managers can use unsecured debt to engage in frivolous consumption and invest in negative NPV projects. Additionally, after unanticipated losses shareholders and/or managers could use resources for asset reconstruction to overinvest in risky assets ('empire-build') at the expense of other contracting constituents.	Insurance terms and loss adjustment mechanisms will ensure that assets are replaced according to the indemnity schedule and on a 'like with-like' basis.	Helps lower the equity cost of capital by assuring market investors that the proceeds of insurance claims will not be wasted and only used to replace and/or repair productive assets.	Hau (2007)
Investment crowding-out (managers and shareholders)	This problem arises where after an unexpectedly severe loss a firm's cash position becomes acutely constrained and external finance costly. Therefore, positive NPV projects may have to be deferred or abandoned thus reducing firm value and creating a loss of market share.	Insurance can mitigate this problem by ensuring that managers have sufficient cash after a catastrophe to enable prospectively attractive projects in a firm's investment opportunity set to be realized. It also helps avoid the risk of managers not protecting cash resources earmarked for investment-e.g. because of inertia and/or negligence.	Insurance primarily reduces the cost of equity by protecting future cash flows from excessive volatility. It also helps reduce agency costs of equity arising, for example, from manager inertia and/or negligent investment planning	Froot et al.(1993)

(Continued)

Agency Problem	Features	Effect of Insurance	Impact on Cost of Equity	Relevant Study

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Claims Dilution (between shareholders and debtholders)	Occurs where shareholders (and managers) issue new debt at an equivalent or higher priority to that of existing debt. This can reduce the claims of primary secured debtholders.	Insurance policies can mitigate conflicting claims on collateralized assets by specifying the primary insured's sole rights to claims in the event of losses. Insurance companies could also supplement banks' monitoring procedures by ensuring firms' compliance with insurance conditions.	Lowers cost of equity by assuring prospective investors of the quality of external financial monitoring and control procedures.	Smith and Warner (1979)
Managerial Risk Aversion/Entrenchment (between manager and shareholders)	Managers will not be motivated to take risks and so maximize shareholders' value because they have private interests to protect (e.g. job security). Managerial risk-taking may increase the variability of cash flows thereby increasing the probability of bankruptcy.	Insurance indemnifies assets against unanticipated losses and ensures the continued generation of cash flows thereby enabling firms to realize their financing and investment goals, and so avoid financial distress/bankruptcy Reducing downside financial risks encourages managers to take risks that benefit shareholders.	Reduces the cost of equity by assuring investors that strategic investment opportunities will be met and shareholders' wealth maximized in the event of catastrophe.	Froot et al. (1993)

(Continued)

Agency Problem	Features	Effect of Insurance	Impact on Cost of Equity	Relevant Study

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Managerial Incentive Conflicts (between manager and shareholders)	Managers compensated with stock options may be motivated to take risky actions which may benefit themselves and shareholders at the expense of debtholders and other claimants (e.g., customers).	Insurance can reduce the downside risk of stock options being 'out-of-the-money' thus increasing the value of stock option plans and enhancing alignment between managerial and shareholders' interests. Alleviating downside risk reduces bankruptcy risk and so protects the interests of debt holders and other contracting constituents.	Reduces the cost of equity by realigning managerial and shareholders' interests.	Hau and MacMinn (2006)
'Tunnelling'/ Expropriation (between controlling shareholders and minority shareholders)	Arises in in companies with highly concentrated ownership structures. Controlling shareholders have incentives to misuse/ re-direct cash to negative NPV projects, and/or non-optimal activities (e.g., high cash dividends and/or sale of collateralized assets). This reduces the value of the firm and undermines minority shareholders' interests. This problem is exacerbated in Chinese PLCs where ownership structure is split into non-tradable shares and tradable shares.	Insurance contracts can restrict the sale of collateralized assets thus mitigating changes in a firm's risk profile. Also insurance commits managers to use cash flows to pay insurance premiums before making dividend distributions. Therefore, insurance can be used to control excessive dividends.	Reduces the cost of equity by realigning controlling shareholders and minority shareholders' interests and increasing overall firm value.	Zou et al. (2008)

(Source: Derived from agency theory literature).This table summarizes the main incentive conflicts that can arise in firms as a result of agency problems (costs) and asymmetric information, how (property) insurance can resolve those agency problems (costs), and strategic impact of (property) insurance purchases on the cost of equity capital.

CHAPTER 4. HYPOTHESES DEVELOPMENT

4.1 Introduction

As previous three chapters make clear, the need for property insurance is underpinned by acute market imperfections such as information asymmetry problems, agency incentive conflicts, and the costs of financial distress and bankruptcy in the Chinese corporate sector. To explain how insurance affects the costs of equity of Chinese PLCs and guide analysis, an appropriate theoretical framework has to be utilized in order to direct research enquiry and give meaning to the empirical results. A review of the academic literature carried out in chapter 3 identified agency theory as an intuitively plausible framework which could be used to provide insights into the link between the purchase of property insurance and the cost of equity of Chinese PLCs. This chapter thus examines the salient propositions of the agency theory and puts forward two principal hypotheses derived from this theoretical framework in order to facilitate empirical testing.

4.2 Towards a Theory of the Interface between Property Insurance and the Cost of Equity

Agency theory implies that the firm-level cost of equity will fall as the amount of insurance increases because in the face of market imperfections (such as agency costs and information asymmetry problems) firm-specific (unsystematic) risks can be cost-effectively transferred to insurance companies that have comparative advantages in risk-pooling and claims settlement (Cho, 1988)[24]. Insurance companies (like banks) are also able to efficiently and effectively monitor managerial risk-taking (e.g., through regular inspections of assets) and control managerial activities through contractual covenants in

[24] Zou and Adams (2006, p. 176) note that property insurance could mitigate both systematic and unsystematic risks. For example, an environmental disaster (e.g., an earthquake or flood) in the economically developed Eastern coastal areas of China could increase levels of systematic risk for Chinese firms and so have an adverse impact on their market cost of capital and level of investors' returns. This reasoning further supports the view that property insurance could help to alleviate the sensitivity of Chinese firms' cash flows to unexpected market risks and so reduce their costs of capital. However, Harrington and Niehaus (2003, p. 446) opine that any beneficial effect on a firm's (opportunity) cost of capital from insuring systematic risks could be offset by lower expected cash flows resulting from higher insurance premium loadings.

insurance policies (Diamond, 1984). As mentioned earlier (chapter 3, section 3.2.7), these attributes can help reduce agency incentive conflicts (costs) between managers and external capital suppliers, and so ensure that sufficient (internal and external) funds are available for managers to take advantage of attractive investment opportunities (e.g., see Froot et al.1993; Doherty and Lamm-Tennant, 2009)[25]. In other words, hedging through the use of property insurance can potentially add value for shareholders by enabling them to avoid external financing and financial distress/bankruptcy costs associated with capital market imperfections (MacMinn and Garven, 2000). What is more, Nance et al. (1993, p. 270) argue that firms whose values mainly comprise growth opportunities face uncertain investment outcomes and potentially enhanced agency problems (e.g., misuse of 'free' cash flow). MacMinn (1987) argues that shareholders in firms with high growth options are more likely to engage in risk-shifting behavior than their counterparts with low growth options. Therefore, the managers of high growth option firms could engage in hedging (insurance) to bond their commitment to reducing the volatility of future cash flows arising from unforeseen perils and so reduce agency costs for shareholders and others. In a similar vein, insurance can help to mitigate earnings volatility in high growth option firms by reducing the scope for ex-post risk shifting (asset substitution) among a firm's portfolio of assets (Ashby and Diacon, 1998, p. 37).

Agency theory predicts a positive relation between the amount of equity retained in a firm and the risks associated with business activities including the risks of unexpectedly severe losses, mismanagement, financial distress and bankruptcy. This suggests that equity is essentially a form of risk capital that protects the value of a firm's assets-in-

[25] Myers and Majluf's (1984) 'pecking order hypothesis' suggests that because of information asymmetries internal funds will tend to be cheaper than external funds, and that managers will have a preference for first using accumulated cash, then debt and finally, equity in order to finance projects in their investment opportunity sets. Insurance therefore helps to hedge the cash flows necessary for managers to undertake positive NPV investment projects and so as noted earlier (chapter3, section 3.2.7), avoid the 'crowding-out' problem that can occur after an unexpectedly severe loss event (Doherty, 2000, pp 212-213). This characteristic of insurance not only means that firms do not have to raise costly debt and equity capital and bear the costs of restoring productive capacity following a major asset loss but it helps their managers to ensure that the firm's long-term investment plans will be realized (Grillet, 1992). This in turn provides surety for existing and prospective investors thus reducing the firm's cost of capital – producing what Doherty (2000) refers to as a 'leverage neutral' loss financing strategy for firms. Such arguments also imply that the 'crowding-out' effect can be likened to an agency cost of equity problem. For example, managerial inertia, shirking or carelessly behavior could result in no/under insurance protection for cash resources earmarked for prospectively positive NPV projects and future shareholder value creation (see also Table 3.2).

place against losses relative to the risk-free investment of those assets (Merton and Perold, 1993). The CAPM implies that in a single-period state with free market conditions the risk-free rate of return cannot be influenced by investors' portfolio decisions. This suggests that if insurance is to affect the equity cost of capital then it must do so via the equity price premium, which is itself influenced by the firm's market beta (systematic risk) (Doherty, 2000). O'Brien (2006) further reports that because hedging (e.g., via insurance) reduces the volatility of future cash flows (e.g., due to unforeseen disasters) it helps lower the cost of equity capital of the firm. Shimpi (2002) adds that releasing equity (risk) capital through hedging (insurance) reduces the deadweight costs of 'misallocated' capital by enabling released funds to be either returned to shareholders (e.g., through share repurchases) and/or invested in positive NPV projects. Indeed, O'Brien (2006) observes that without insurance the managers of a firm suffering an acute unanticipated loss event would find it difficult ex-post to obtain new financing to rebuild depleted assets and undertake future positive NPV projects[26].

In developing his 'insurative model', Shimpi (2002) views that the total level of risk capital held by firms is the incremental amount of equity capital in excess of that needed to maintain current operations, avoid agency problems, and reduce the risks/costs of financial distress and bankruptcy[27]. His research suggests that in exchange for regular (annual) premiums (financed from operating capital) insurance reduces a firm's aggregate risk capital requirements, optimizes capital usage, alleviates agency problems (e.g., the managerial misuse of share capital) and reduces bankruptcy risk thereby lowering the overall cost of equity. Shimpi (2002) contends that the economic benefits of releasing equity through the purchase of insurance can be greater than the insurance premium paid and that because the insurer is likely to be more diversified than its corporate client then risk transfer could be optimal compared with a firm retaining risk. In other words, market exposures place retained economic capital at an increased risk of

[26] Doherty and Tinic (1981) report that the amount of insurance supplied to, and purchased by, managers may be affected by the insurer's perceived assessment of a firm's immediate risk of financial distress/bankruptcy. That is, insurance coverage may be constrained by the insurer's assessment of the firm as a 'going concern' in the short-term.

[27] Shimpi (2002) also asserts that an excess amount of equity may be held by firms in order to signal additional financial strength to the capital markets.

depletion following a loss event; but retaining capital in anticipation of such losses is inevitably costly. Therefore, insurance reduces capital tied-up in market risk thereby releasing risk capacity for more economically productive uses within the company. Shimpi's (2002) 'insurative' model explicitly recognizes that the financing opportunities of managers include both on-balance sheet finance like equity, and off-balance sheet (contingent) capital such as insurance. In other words, Shimpi (2002) argues that capital structure decisions and risk management (insurance) decisions are 'two sides of the same coin'.

Jensen's (1986) free cash flow hypothesis postulates that managers could over-invest (e.g., in negative NPV projects) unless controlled by independent monitors and/or bound by contractual mechanisms such as debt covenants[28]. The requirement to make regular premiums under insurance policies could therefore induce corporate managers to generate free cash flows to meet their periodical contractual obligations and ensure that the 'real' advisory services and monitoring functions of insurance companies continues to provide value for shareholders (e.g. see Stulz, 1990). Hau (2006) argues that property insurance, even at actuarially unfair rates of premium, may be optimal where firms' outputs are subject to large financial penalties in cases of contractual breach, which could occur after a severe loss event. For example, Hau (2006, p. 274) states that a ". . . rise in insurance coverage raises the contracted level of output and revenue in both good and bad states such that the marginal benefit of property insurance is higher than the expected marginal benefit of post loss financing." Hau and MacMinn (2006) also show that insurance can alleviate the adverse agency problems associated with a speculative overinvestment strategy induced by stock option-based executive compensation schemes. Hau (2007) further demonstrates that the (property) insurance requirements of debt contracts mitigate the opportunity costs of risky asset reconstitution after a severe loss event and so helps to preserve shareholders' wealth. Insurance can further mitigate agency costs arising from aberrant managerial behavior such as that adversely affecting employees, third parties and externalities (e.g., pollution costs) (Ashby and Diacon, 1998, p. 37). While Haushalter et al. (2007) take a strategic focus for the use of hedging, they also point out that hedging (insurance) can reduce the agency costs of equity by

[28] Overinvestment here refers to the agency problem where managers could overinvest in (self-gratifying) projects relative to the investment level that currently maximizes shareholders' wealth (e.g. see Tufano, 1998 and Table 3.2).

encouraging managers to engage in investment activities that protect a firm's competitive position and market share (i.e., reduce predation risk). Such activities could help to reduce the costs of equity for companies, particularly those operating in highly competitive markets.[29]

Zou and Xiao (2006) report that managers of Chinese PLCs, particularly those in SOEs, could be motivated to use equity rather than debt because the level of debt finance may be restricted and/or impose too many constraints on usage. This situation could, however, increase agency costs for investors by increasing opportunities for managers to use funds inappropriately – for example, by increasing rates of perquisite consumption. These institutional risks and intrinsic agency incentive conflicts could substantially increase the cost of equity capital for Chinese PLCs (Zou and Adams, 2008b). However, insurance can alleviate such problems by subjecting managers and their systems of corporate governance to the external risk assessment and monitoring activities of insurance providers. This attribute can help to reduce the costs that capital providers face in screening issuers' creditworthiness ex-ante and monitoring compliance with their expectations of risk and return on their investment ex-post (Grace and Rebello, 1993). Property insurance could also help to increase the traded liquidity of a firm's shares by assuring brokers, analysts and investors as to the future cash flow generating opportunities of a firm's underlying assets. This quality can further help to reduce a firm's cost of equity capital (Amihud and Mendelson, 2000). In other words, insurance can help promote the liquidity of shareholdings by mitigating information asymmetries and reducing agency costs between 'insiders' (manager and/or current shareholders) and 'outsiders' (prospective investors /traders/ analysts)[30]. Improving liquidity also helps the functioning of financial markets (Amihud and Mendelson, 2000) - an important issue for a large emergent economy, such as China, with widely acknowledged information asymmetry problems between buyers and sellers of securities (Zhang and Ding, 2006). Moreover, Froot et al. (1993, p. 1653) argue that

[29] In fact, Jiang et al. (2012) report that China's corporate sector has become more competitive over the last decade or so.

[30] For this reason, the managers of small firms and IPOs in particular, are expected to voluntarily insure assets and publicly disclose the level of premiums paid/amount of indemnity coverage. Additionally, an IPO's underwriters will inevitably hope for a fully subscribed listing and so taking out adequate property insurance cover is likely to be in their interest as well as for the listing company and their analyst following (e.g., see Zou, 2010).

hedging (e.g., via insurance) alleviates potential agency costs as it enables managers to generate 'free' cash flows and reduce inter-temporal earnings volatility. This attribute could again help to reduce the cost of equity - for example, by assuring investors as to the quality of the firm's future growth opportunities.

4.3 Hypotheses Development

4.3.1 Main Hypotheses

In essence, agency theory predicts that, amongst other things, managers could decide ex-ante to insure their assets because: (a) it mitigates information asymmetry problems by transferring risk externally and relying on the ability of the insurer to effectively screen and monitor the firm's risk profile through its underwriting activities; (b) insurance reduces the amount of equity held by the firm to cover severe unanticipated loss events thus optimizing capital utilization; and (c) insurance provides surety to investors regarding the realization of future growth opportunities (e.g., by mitigating the volatility of future cash flows and reducing bankruptcy risk), reduces investors' concerns about the probability of financial distress following extreme loss events, and minimizes of agency costs (e.g., investment crowding-out, and manager risk aversion). That is, insurance mitigates the agency problems and protects the interests of financial claimants such as shareholders (Zou et al., 2003; Zou and Adams, 2006; Jiang, et al., 2012). As a result, investors would require a lower return on invested capital if a firm insures its property (productive assets). This leads to the first hypothesis:

> H_1: Other things being equal, firms purchasing property insurance are likely to have a lower cost of equity than firms not purchasing property insurance.

Furthermore, in China, investors invariably face severe information asymmetry problems (e.g., due to inadequate accounting disclosures on risk aspects of the business) and other frictions (e.g., perquisite consumption by managers) which inhibits the efficiency of market investment decisions (Zou and Adams, 2008b). Such potential agency conflicts and other market inefficiencies (e.g., lack of risk management knowledge and expertise) could mean lower-insuring Chinese PLCs are operating sub-optimally in equilibrium and incurring higher costs of equity (lower traded values) than their counterparts with higher insurance coverage. This reasoning further suggests that

firms purchasing higher levels of property insurance are likely to have a lower cost of equity than firms with lower levels of property insurance. However, insurance policies are indemnity contracts. Therefore, any ex-post claim payments will thus be capped at the minimum of actual loss and the sum insured. In other words, the ability of insurance to reduce the cost of equity is unlikely to be without limits (e.g. see Zou, 2010). Therefore, over-insurance of an asset would invariably incur extra 'deadweight' costs but bring no financial benefits to firm. Over-insurance can also increase *risks* for shareholders. For example, over-insurance can promote managerial entrenchment (inertia) and increase the *risk* that managers will exercise excessive caution in the use of productive assets. This can reduce the opportunities for creating value for shareholders in highly competitive markets such as China (Tufano, 1998). Excess spending on (property) insurance can also exacerbate liquidity problems for firms and in extreme cases, increase financial distress/bankruptcy risks. This suggests that beyond some optimal point, increasing insurance spending could increase the cost of equity because investors see it as a 'waste of money' that increases agency costs (e.g., managerial inertia and moral hazard) and associated business risks such as lost investment opportunities. This reasoning suggests that the relation between the extent of property insurance use and the cost of equity could take a non-linear U-shape function. Therefore: the second hypothesis is:

> H_2: Other things being equal, there is likely to be a U-shape relation between the cost of equity and the extent of property insurance use.

These two primary hypotheses will be tested during the course of the research project. However, as other factors can influence the property insurance-cost of equity relation, control variables (e.g., firm size, leverage, and so on) will enter the analysis conducted in the Chapter 6 (section 6.4.3).

4.3.2 Subsidiary Hypothesis

If hypotheses 1 and 2 are empirically consistent with the agency theory notion that property insurance reduces the cost of equity of firms, a further investigation into whether insurance reduces the cost of equity by mitigating agency problems could be insightful. As Table 3.2 makes clear, some agency problems between shareholders and managers could lead to firms reducing investment expenditures. For example, managers

have incentives to avoid risk-taking and even forgo value-enhancing risky projects to protect their career and enjoy a 'quiet-life' (i.e., manager risk-aversion incentive). Also, manager may have to defer or abandon positive NPV projects as the firm's cash position becomes acutely constrained after an unexpectedly severe loss (i.e., investment crowding-out problem). However, with the protection of firms' productive assets by property insurance, managers' investment decisions might be less conservative and more optimal from the perspective of maximizing shareholders' utility. Thus, a potential benefit of a reduction in the cost of equity via the purchase of property insurance is expected to facilitate a firm's investment in positive NPV projects by resolving those problems. Consequently, a third hypothesis is that

> H_3: Other things being equal, firms with property insurance (or more property insurance) are likely to spend more on prospective investment, and have a lower cost of equity compared with those firms with no property insurance (or lower property insurance).

4.4 Summary and Conclusions

This chapter draws on the main aspects of agency theory and considers their implications for explaining the link between property insurance and the cost of equity in the Chinese corporate sector. Three test hypotheses are put forward in this chapter in order to direct empirical testing. To protect and promote the shareholder wealth maximization function, agency theory holds that insurance can mitigate the key agency problems in firms listed in Table 3.2, and as such, help lower their cost of equity. However, the ability of property insurance to completely reduce agency costs may be limited. Therefore, the relation between the extent of property insurance use and the cost of equity could U-shaped. Furthermore, if insurance reduces the costs of equity as predicted by agency theory, then this could be a result of mitigating agency incentive conflicts such as the managerial risk aversion and the investment crowding-out problems. In other words, property insurance can encourage managerial risk-taking and facilitate the investment of positive NPV projects thereby increasing value for shareholders. The research approach used in this study to test empirically each of the three hypotheses advanced in this part of the thesis is now examined in the next chapter of this thesis.

CHAPTER 5. COST OF EQUITY CAPITAL METRICS

5.1 Introduction

Firms do not pay set annual returns to the equity investors, and, the cost of equity is not directly observable and difficult to calculate (Fama and French, 2004). Therefore, it is a challenge to quantify accurately the cost of equity capital in the finance literature; indeed there is no well-accepted model for estimating the cost of equity. The cost of equity capital can be defined in different ways depending on one's perspective. From the managerial view, it is the rate used to discount the future cash flows of a project under consideration; and from investors view, it is their expected rate of return traded-off against the level of risk undertaken. In the academic literature, researchers have proposed various cost of equity metrics including ex-post models (e.g., the CAPM); and the Fama-French three-factor (FF3F) model) and ex-ante (accounting-based) valuation models (e.g., the residual income valuation (RIV) model; abnormal earnings growth (AEG) model, the price earnings growth (PEG) model, and the modified PEG (MPEG) model). The main difference between ex-post and ex-ante cost of equity models is that the former metrics use historical information on realized stock returns to compute the cost of equity, while the latter employ analysts forecasts data to derive measures of the cost of equity. Whilst all these cost of equity models have advantages they also have limitations in different financial and institutional contexts (eg., see Perold, 2004). Therefore, this chapter of thesis reviews and selects those metrics for determining the cost of equity capital that best fit the Chinese context of the present study.

5.2 Ex-post Cost of Equity Models

As Table 5.1 makes clear, there are four main ex-post models that are commonly used to estimate the cost of equity, namely the CAPM, FF3F model, Arbitrage Pricing Theory (APT) and the non-parametric Rubinstein-Leland Model (R-L). The latter three models are all derived in some respects from the basic CAPM (Fama and French, 2004). The main features of these four models are described and evaluated below.

5.2.1 The CAPM

As noted earlier in chapter 3 (section 3.2.2), the CAPM as developed by Sharpe (1964) and Lintner (1965) represents a benchmark in asset pricing theory and draws heavily on the concepts of portfolio thereby developed by Markowitz (1952). It is also the most commonly used metric to estimate the cost of equity both in the academic literature and finance practice (Graham and Harvey, 2001). Essentially, the CAPM basically addresses the question: how does the riskiness of an investment (asset) affect its return? (Perold, 2004). The model takes into account a firm's systematic (i.e., non-diversifiable/market) risk, which is reflected by the market beta (ß). The cost of equity under the CAPM is defined as:

$$R_i = R_f + \beta_i (R_m - R_f) \qquad [5.1]$$

where: R_i = the CAPM cost of capital for firm i;
R_f = the expected return on a default risk-free rate asset (e.g., a government security); β_i = a measure of the systematic market risk for firm i, with $\beta_i = Cov(R_i,R_m)/Var(R_m)$; R_m = the expected return on the market portfolio.

The key contribution of the CAPM is that it explicitly recognizes that asset diversification directly influences securities' returns and market prices (Fama and French, 2004). This insight has helped influence, amongst other things, the practice of capital budgeting, portfolio analysis and investment strategy (Perold, 2004). However, the CAPM is subject to strict maintained assumptions (e.g., the absence of transaction costs and taxes). Additionally, the market's expected risk premium has to be estimated ex-ante (as a proxy for expected asset value) because future asset prices are not directly observable (Fama and French, 2004). What is more, the historical magnitude of the market risk premium and the effects of institutional environment factors (e.g., the state of the macroeconomy) are often difficult to determine with precision. For example, Botosan (1997) and Lakonishok (1993) argue that it would need at least 60 years of realized security returns to estimate a reliable CAPM derived beta and so compute a reasonably accurate and statistically robust estimate of the cost of equity. The CAPM has other notable limitations as a cost of equity metric. For example, Lee and Cummins (1998) report that the CAPM is not only a single-period model and as such, cannot deal effectively with cross-temporal variations in firms' risk profiles (e.g., betas), but that it is also founded on assumptions of perfect information in markets and multivariate normal securities' returns data. Perold (2004) adds that the CAPM assumes that all

investors have equal access to the same investment opportunities and that they make the same estimates of individual assets' expected returns.

Fama and French (2004), Perold (2004), amongst others, report that there have been several variants on the basic CAPM in the literature. For example, Lambert et al. (2007) recast the CAPM into a form that explicitly allows for inter-correlated cash flows between firms. They show that the ratio of expected future cash flows to the covariance of a firm's cash flows with the market's cash flows is a key determinant of the equity cost of capital. Lambert et al. (2007) further demonstrate that better public disclosure of financial information helps to reduce the market risk premium and so lowers the cost of equity. [31] Wei (1988) develops a hybrid of the CAPM and APT metrics and demonstrates that this hybrid model is an important advancement on the standard CAPM. However, the hybrid model still retains many of the shortcomings of the CAPM such as the single-period context. Indjejikian (2007, pp. 423-424) further notes that the static single-period assumption of the CAPM is too simplistic and that investors are likely to be interested in how their asset portfolios are affected by future investment opportunities. As a result, he argues that the CAPM can offer only limited theoretical insights into the determinant factors affecting asset prices in market. For example, he contends that time-invariant models cannot accommodate changing levels of market uncertainty over time. As insurance premiums and coverage levels vary over periods of high and low uncertainty, the CAPM and its hybrid models are therefore likely to have shortcomings in the context of the present study. This is particularly likely to be the case in emerging markets such as China where highly volatile share price movements are observed over time (Zhang and Ding, 2006). Zhang and Ding (2006,p. 385) also report that in the recent past, China's less stringent accounting rules have enhanced information asymmetry problems for investors. This institutional limitation potentially reduces the effectiveness of the CAPM for estimating the equity cost of capital. Nonetheless, the CAPM's relative simplicity and popularity in academic and practitioner circles does warrant its use as a comparative benchmark metric in this study.

[31] Perold (2004, p.21) describes another variant on the basic CAPM-namely, the International CAPM (ICAPM). The ICAPM introduces the effects of foreign exchange rate movements on asset prices and the risk-return of asset portfolios, and consequently, investors' decisions.

5.2.2 Arbitrage Pricing Theory (APT)

An early conceptual advancement on the CAPM is Arbitrage Pricing Theory (APT). (Adams, 2002) In estimating asset prices (cost of equity), the APT is generally applied in the same way as the CAPM. However, APT requires less strict assumptions of portfolio and investors' behavior than those of the CAPM. For example, Grinblatt and Titman (1987) report that the CAPM assumes that: a) returns on assets follow a normal distribution over time; b) investors are rational decision-makers; and c) portfolio investors can access security markets without informational and/or regulatory restrictions. In contrast, APT does not require such strict these assumptions to hold and so it is ostensibly more flexible and comprehensive in terms of its potential application in different financial and institutional contexts (Ross, Westerfield and Jaffe, 1998, p.231). The salient features of the APT model are that it incorporates key macroeconomic variables (e.g., inflation and interest rate risk) that might affect investors' expected returns and thus the cost of equity (Adams, 2002). The APT model can be defined as:

$$r = R_f + \delta_1\beta_1 + \delta_2\beta_2 + ... + \delta_n\beta_n \qquad [5.2]$$

where: $\delta_1 \ldots \delta_n$ = risk factor values;
$\beta_1 \ldots \beta_n$ = betas for each factor loading.

Lee and Cummins (1998) show that APT produces more reliable cost of equity estimates than the CAPM but they report that it is rarely used in practice for various reasons. Such reasons include the heavy analytical constraints that APT places on data (e.g., the requirement for synchronous and frequently traded share price data) and the theoretical inability to determine the macroeconomic factors (and their direction of influence) that impact directly on securities' returns. Additionally, a key assumption of APT is that there is a wide number of bonds available in the market to enable a firm to create/replicate a portfolio that effectively diversifies the market pricing risk of its equity (which is necessary in order to derive reliable and robust cost of equity estimates). Given such an assumption, several researchers (e.g., Ross 1976; Grinblatt and Titman. 1987) have argued that APT is most suitable for estimating asset prices (cost of equity) when firms have well-diversified portfolios. However, given the lack of data on firms' asset portfolios in the Chinese corporate sector, APT is unlikely to be a useful metric for estimating the cost of equity in the present study.

5.2.3 FF3F Model

Graham and Harvey (2001) report that the FF3F model is another cost of equity metric that is sometimes used by finance practitioners. Conceptually, the FF3F model extends the CAPM by incorporating key risk factors that help to control for the effects of firm size (market capitalization) and corporate growth prospects (the book-to-market equity ratio) on the cost of equity capital. Empirical evidence (e.g. Fama and French 1992, 1993) shows that including such factors could capture expected returns on firms' asset portfolios that is not explained by the CAPM's classical beta. Other potentially important explanatory variables of expected securities' returns are leverage (debt-equity ratio) and the price-earnings ratio (Fama and French, 1992). In essence, the FF3F model predicts that, all else equal, large firms will tend to have relatively lower overall costs of equity than small firms because of their lower risk profile. The book-to-market ratio is also often interpreted as providing a market risk premium for financial distress (Fama and French, 1995). Consequently, other things being equal, firms whose investment opportunity set largely comprises growth options rather than assets-on-place are expected to have higher costs of equity than other firms. The FF3F model can be expressed as:

$$E(r_i) = r_f + \beta_{mi}[E(r_m) - r_f] + \beta_{si}\Omega_s + \beta_{hi}\Omega_h \qquad [5.3]$$

where: rf = risk-free rate;
β_{mi} = the market beta;
β_{si} = the beta for size;
Ω_s = the expected market risk premium for firm size;
β_{hi} = the beta for the book-to-market equity factor; and
Ω_h = the expected market risk premium for the book-to-market ratio.

Bornholt (2007, p.70) points out that although there is some convincing empirical evidence in favor of the FF3F model, there are two main criticisms with the metric. First, the method used by Fama and French (1992,1993,1995,1997) to construct their firm size and book-to-market factors is empirically rather than theoretically driven and seems 'ad hoc' in nature. Second, it is difficult to determine precise forward-looking estimates of the three factor sensitivities and market risk premiums, particularly as securities that experience initial gains (losses) tend to carry these gains (losses) forward over the remainder of the accounting period. Fama and French (2004) refer to this phenomenon as the "momentum effect". In fact, empirical evidence from the UK reported in Ashton and Tippett (1998) shows that estimates of firms' betas are sensitive to mis-

specification of the market portfolio leading to biased estimations regarding the effects of book-to-market ratios in explaining asset prices (cost of equity). This limitation with the FF3F model may be difficult to address in practice and this possibility has led Gregory and Michou (2009, p. 679) to state that the FF3F model "… paints a fairly bleak picture of the prospects for being able to estimate the cost of capital of any firm or industry with any degree of accuracy." Cummins and Phillips (2005) further argue that the FF3F model requires lengthy estimation periods of 30 years or more to derive robust results. As publicly available financial data for Chinese PLCs only became available after 1997 (Zou et al., 2003), this constraint is likely to be a major limiting factor in using the FF3F model in present study. Additionally, like the CAPM and the APT model, the FF3F model requires synchronous and frequent securities trading. These considerations could also reduce the applicability of the FF3M in this research project given that some segments of the Chinese stock market (e.g. State-owned utilities) are often thinly traded (Sun and Tong, 2003).

5.2.4 Rubinstein and Leland (R-L) Model

The CAPM and its variants operate under the assumption that the risk and return of a market portfolio of assets is mean-variance efficient where it is assumed that (a) all asset returns are normally (and thus symmetrically) distributed; and (b) investors care only about the mean and variance of expected returns (which implies that they view upside and downside risks with equal preference)(Fama and French, 2002, 2004). However, in practice, Leland (1999) argues that neither assumption can be justified as portfolio returns are in general not normally distributed. He further points out that even if the underlying assets' returns are normally distributed, the returns of portfolios that use options on those assets and/or use dynamic strategies would not be normally distributed. Also, many market investors are typically not risk-averse-types but rather risk-takers. Consequently, investors would distinguish between upside and downside risks in making their portfolio choices. For example, positively skewed security returns are preferred by most rationally-minded investors, which implies that in equilibrium portfolio asset prices held by a firm are unlikely to be consistent with the mean and variance rule of a normally distributed market portfolio (Leland, 1999). Therefore, as noted previously, the basic theoretical underpinnings of the CAPM may not hold in reality particularly in China. Fama and French (2004, p.44) arrive at a similar

conclusion from their analysis of the empirical validity of the CAPM. Compared with the intrinsic mean-variance rule of the CAPM and its variants, the R-L model has a non-parametric (distribution-free) feature that can capture all elements of the distributional frequency of asset price risk including skewness, kurtosis and higher moments. Kozik and Larson (2001) proposed an "N-moment CAPM" which also addresses the skewed risk-return (price) distribution issue. However, compared with the R-L model, Kozik and Larson's (2001) variant model is limited by the moments associated with investors' risk-return preference; it also requires securities' returns to be finite over time. These conditions are unfortunately difficult to control for empirically (Wen, Martin, Lai, and O'Brien, 2008) and therefore, likely to be inappropriate in the context of the current study.

Leland (1999) showed that the CAPM and the R-L model give similar asset price (cost of equity) estimates for assets that are symmetrically distributed. However, for assets where returns are asymmetrically distributed, Leland (1999) finds that the R-L model gives more statistically robust estimates of the cost of equity than the CAPM. Wen et al. (2008) use the R-L model to calculate the cost of equity for US property-liability insurance companies. The non-parametric assumptions underlying the R-L model therefore appear to offer prospects for its application in this study given the acknowledged volatility and frequent 'thin trading' observed in China's stock markets (e.g., see Poon et al., 1998, Sun and Tong, 2003). Researchers such as Fama and French (1997) and Cummins and Phillips (2005) also contend that industry factors and time-effects (e.g., the state of macroeconomic conditions) can influence the cost of equity. Such influences can be accommodated within the R-L model as in the time-series asset pricing analysis conducted in Wen et al.(2008). Wen et al. (2008) further note that the R-L model requires no more information to implement than the basic CAPM but that it nonetheless captures all the key elements of asset risk, including skewness and kurtosis that describe the shape of the asset price distribution. The R-L model can be expressed by:

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f] \qquad [5.4]$$

where: $E(R_i)$ = required return for asset i;
R_f = risk-free rate; and
$E(R_m) - R_f$ = market risk premium;

$$\beta_i = \frac{COV[R_i, -(1+R_m)-b]}{COV[R_m, -(1+R_m-b]};$$
$$b = \tfrac{1}{2} + \frac{E[\ln(1+R_m)] - \ln(1+R_f)}{VAR[\ln(1+R_m)]}.$$

However, a key constraint of the R-L model is that for it to be effectively applied empirically a measure of the degree of investors' risk aversion (so-called parameter *b*) has to be estimated. In most of the academic literature, the degree of risk aversion of investors is related to the market equity risk premium (Fama and French 2002, 2004). Leland (1999) viewed parameter *b* as the market's price of risk-namely, the market's instantaneous excess rate of return divided by the variance of the market's instantaneous rate of return. Numerous researchers have attempted to quantify the degree of risk aversion. For example, Friend and Blume (1975) used an empirical survey of consumer wealth allocation to estimate parameter *b*. Campbell (1996) includes the effects of human capital and the mean aversion character of the stocks index to estimate the value *b* as 3.63. Wen et.al. (2008) specify an integer of four based on Campbell (1996) as a common preference parameter *b* measure. On this basis, Wen et al. (2008) assume that *b* = 4 and use a risk-free rate of 3 percent and a market risk premium of 5 percent in order to estimate the equity cost of capital. However, the parameter *b* estimated using historical Chinese stock market data, is negative and so it does not seem practical to use the R-L model in present study.

5.3 Ex-ante Cost of Equity Models

As noted earlier, researchers such as Fama and French (2002, 2004) argue that ex-post cost of equity models are imprecise due to uncertainties regarding estimating the magnitude and timing of market risk premiums and risk loadings. Other researchers (e.g.,Elton 1999; Botosan and Plumlee 2005; Botosan, Plumlee and Wen, 2011) also find that the correlation between expected market returns and realized securities returns is weak. This observation accentuates concerns about the validity ex-post models to accounting and consistently and accurately estimate the equity cost of capital.

In view of such limitations, accounting-based ex-ante cost of equity models have been developed and reported in the academic literature. These metrics include the dividend

discount model (DDM)-the longest established ex-ante cost of equity estimation metrics as well as more recent developments such as RIV model (e.g., Feltham and Ohlson, 1995), AEG model (e.g., Gebhardt, Lee and Swaminathan, 2001), PEG and MPEG model (e.g., Easton, 2004). In essence, the RIV, AEG and MPEG models are earnings-based valuation models that are predicated on the general idea of substituting asset prices and analysts' earnings forecasts with an equity valuation equation. In these cases, the implied cost of equity is derived as the internal rate of return that equates current share prices with the expected future sequence of residual income or abnormal (i.e., above market average) earnings growth. These four ex-ante cost of equity models are reviewed below.

5.3.1 The DDM

A widely used variant of the DDM is the Gordon Dividend growth model (see, Gordon, 1959). It can be represented as:

$$Ke = \frac{D_{t+1}}{P_t} + g \qquad [5.5]$$

where: D_{t+1} = the next expected dividend ($D_t \times (1+g)$);
P_t = current share price; and
g = the constant growth rate of dividends.

Due to its simplicity, the DDM is popular amongst academic researchers and practitioners. The model has three main assumptions. First, the industry returns cash to shareholders; second, dividends paid are a fixed proportion of earnings; third, dividend payments grow at a steady rate perpetually. The first assumption also incorporates share repurchases in case the shares being bought back are expired-for example, by not being redistributed among employees and staff. These assumptions are more likely to hold in case of mature industries. Apart from that, this model cannot be used for firms that do not pay dividends. Moreover, a constant growth rate of dividends implicitly assumes that distributable earnings grow perpetually at a steady rate, which is unlikely to hold in reality. Also, this model requires a long time-series of dividend forecasts as the effect of future dividends on valuation diminishes at a slow rate. For the above reasons, DDM is not used in the present study.

5.3.2 The RIV Model

Over the last decade or so, the RIV model has become a prominent method in the academic accounting and finance literature for calculating the cost of equity. Sutton (2004, p.131) defines the broad framework of RIV as the overall change in net assets (NA) in the year, excluding the effects of dividends (D) and changes in share capital (ΔSC). Thus for year t:

$$CI_t = (NA_t - NA_{t-1}) - \Delta SC_t + D_t \qquad [5.6]$$

where : CI = comprehensive income;
NA = net assets;
ΔSC = changes in share capital; and
D = dividends.

Excluding changes in share capital eliminates the 'non-clean' net income reported in the income statement generated under GAAP. A key attribute of the RIV model is its ability to utilize published accounting data to determine the corporate cost of equity and hence firm valuation. The RIV method uses analysts forecasts of a company's excess annual earnings (i.e., annual net income after charging for the cost of the equity capital employed), which are then brought back to current values by discounting projected earnings using a measure of the cost of equity. The cost of equity is derived by taking the intrinsic value of a firm's equity as the initial (accounting) book value (i.e., invested equity capital) plus the NPV of future residual income (i.e., value created) emerging from business operations (e.g. Feltham and Ohlson 1995; Ohlson 1995). However, specification of the valuation model under the RIV framework relies on the assumptions made of the terminal value of firm. For example, Gebhardt et al. (2001) assume that the return on equity (ROE) will linearly decline to an industry-based ROE in 12 years. Claus and Thomas (2001) assume that the residual earnings develop at a constant rate beyong the forecast horizon. Under such assumptions, current share price 'P_0' can be represented as a function of book value 'B' per share, steady state growth in clean surplus 'g', realized return on equity 'ROE' and cost of equity capital 'Ke' as:

$$P_0 = B_0 + \sum_{t=1}^{n} \frac{(ROE_t - k_e)B_{t-1}}{(1+k_e)^t} + \frac{[(ROE_n - k_e)(1+g)B_{n-1}}{(k_e - g)(1+k_e)^n} \qquad [5.7]$$

where : P_0 = current share price;
ROE = return on equity;
B = book value per share;
g = constant growth rate; and
Ke = cost of equity capital.

Clearly, from the notation, it is evident that the cost of equity of a given firm could be calculated from readily available accounting data, which can be advantageous empirically (Ohlson, 1995). On the other hand, the RIV model has acknowledged shortcomings. For example, with the RIV model the market valuation of the firm depends on the NPV of expected dividends per share, and so applying the RIV model requires determining a 'clean surplus' (Walker 1997)[32]. However, the academic literature records that the use of annual earnings can be inconsistent with the concept of clean surplus accounting, notably the requirement to accurately determine abnormal annual earnings for firms (Walker, 1997). Botosan and Plumlee (2005) also show that as a cost of equity metric, the RIV model does not perform well in continental European countries where lax corporate accounting rules and practices (or 'dirty surplus' accounting) often exist. However, in defence of the RIV model, Ohlson (1995, p. 662) argues that the expected values of 'dirty surplus' items are approximately zero, which essentially 'assumes away' the possible problem of potentially confounding effects. Ohlson (1995) further points out that the prospect of "noise" being introduced into clean surplus accounting need not be severely detrimental to RIV as a concept. However, in the context of China, corporate accounting standards and practices have largely been inconsistent with the concept of clean surplus accounting until very recently. For example, Chinese PLCs have only been required to strictly follow International Financial Accounting Standards (IFRS) which encourages clean surplus accounting from January 2007. As the data used in this study are from 2003 to 2007, it is thus not feasible to utilize the RIV model in this study.

5.3.3 AEG Model

As with the FF3F model, the AEG model estimates the cost of equity in line with firm-specific risk factors (e.g., firm size). The core aspects of the AEG model show how next-period earnings per share (EPS) and EPS growth relate to a firm's current price per share (Ohlson and Juettner-Nauroth 2005). Gebhardt et al.(2001) and Gode and

[32] In essence, 'clean surplus' accounting assumes that the market value of the firm is the sum of its book value plus the sum of abnormal earnings that the firm is expected to generate over its life time. Abnormal earnings are the difference between accounting earnings and the opening book value of assets multiplied by the required rate of return. Abnormal earnings are therefore the equivalent of residual income (Walker, 1997).

Mohanram (2003) report that implied cost of equity capital estimates based on both the RIV and AEG models are generally reliable and consistent cross-sectionally and over time. However, compared with the RIV model, the AEG model has some clear advantages. For example, the AEG model neither requires a book value construct for assets nor does it rely on the assumption of clean surplus accounting. Furthermore, the related assumptions regarding relevant future income valuation mean that annual EPS data are notionally as easy to work with as total annual earnings. Additionally, the possibility of changes in the value of outstanding shares has little adverse implications for firm valuation, while investment returns revolve around earnings creation and their subsequent growth, not asset accounting-based book values and their subsequent growth (Ohlson 2001).

In deriving an estimate of the cost of equity, the AEG model uses capitalized next-period earnings per share (EPS) as the first value component, and it then adds the NPV of capitalized expected changes in annual earnings, adjusted for dividends, as the second component (Ohlson, 2001). From Ohlson (, 2001) the AEG cost of equity estimation procedure can therefore be expressed as:

$$KE_t = \sqrt{A_2 + \frac{EPS_{t+1}}{P_t} \times \frac{EPS_{t+2} - EPS_{t+1}}{EPS_{t+1}} - (r-1)} \qquad [5.8]$$

$$A = \frac{1}{2}[(r-1) + \frac{DPS_{t+1}}{P_t}]$$

where: EPS_{t+1} and EPS_{t+2} = one and two years forecasts of earnings per share;
DPS_{t+1} = the one year forecast of dividend per share;
P_t = the current price; and
(r-1) = the perpetual growth rate to which the short-term growth declines gradually over time.

Nonetheless, Ohlson and Juettner-Nauroth. (2005) contend that this specification of the AEG model cannot fully take into account complex scenarios such as the evolution of expected EPS over time. For example, a firm could incur increasing annual losses before realizing above normal EPS performance thereby making accurate estimates of the cost of equity difficult to achieve in practice. In addition, Easton and Monahan (2005) and Guay, Kothari and Shu (2005) report that the relation between future realized securities' returns and implied cost of equity capital estimates based on AEG models can be weak and sensitive to the accuracy of financial analysts' forecasts.

5.3.4 PEG and MPEG Models

The PEG model derives the implied cost of equity from a firm's share price-earnings growth relation and as such, it is a special case of the AEG model (Botosan and Plumlee, 2005). Easton (2004) posits that a key feature of the PEG model is that it utilizes rates of return implied by current asset prices and forecasts of future payoffs (earnings and earnings growth). This is analogous to internal rates of return calculated from the market price of a bond and coupon payments. Easton (2004) demonstrates empirically that cost of equity estimates derived from the PEG model perform better than those based on the price-earnings (P/E) ratio using data drawn from the US corporate sector. Botosan and Plumlee (2005) evaluate the RIV, AEG, and PEG models and they also find that the PEG model generates the most consistently robust results in repeated statistical tests of the cost of equity among US firms with different risk profiles (e.g., in terms of betas, leverage, price-to-book values, and so on). Lee et al. (2006) further suggest that the PEG model is parsimonious compared with the AEG and RIV models, and has the key advantage of utilizing readily observable accounting-based parameters. Moreover, the PEG model performs well where 'clean surplus' assumptions (e.g., efficient market information (good accounting)) might not hold in reality (as may, for institutional reasons, be the case in China). Subject to fewer assumptions, Easton (2004) modifies PEG, and presents the MPEG as:

$$Ke_t = A + \sqrt{A^2 + \frac{EPS_{t+2} - EPS_{t+1}}{P_t}}, A = \frac{DPS_{t+1}}{2P_t} \qquad [5.9]$$

where: EPS_{t+2} and EPS_{t+1} = one and two year forecasts of a firm's earnings per share;
P_t = the current share price, assuming zero abnormal return beyond the forecast horizon;
DPS_{t+1} = Dividend per share at year t+1.

However, if the assumption that Chinese firms' long-term earnings growth extends beyond the forecast horizon does not fit the corresponding market's expectations, then the implied cost of equity derived from the PEG (MPEG) model could be "noisy". Another potential shortcoming is that the PEG (MPEG) model requires EPS to be positive over time (which is an unrealistic assumption in highly volatile markets such as China). This limitation could further bias samples towards less risky firms thus producing unreliable estimates of the cost of equity (Lee et al., 2006, pp. 14-15). Consequently, such drawbacks need to be taken into account when interpreting cost of equity estimates derived using Chinese corporate accounting data. Nonetheless, the

ability of the MPEG model to cater for many institutional difficulties, such as inefficient corporate accounting, makes it a potentially interesting cost of equity model to evaluate alongside more established metrics such as the CAPM.

5.4 Summary and Conclusions

This chapter reviews the main cost of equity estimation models in the accounting and finance literature and summaries of those cost of equity metrics are presented in Table 5.1. First, ex-post cost of equity models are evaluated. The CAPM is the most common cost of ex-post equity metric adopted by academics and finance practitioners, and so sued in this study (though it has acknowledged disadvantages). The APT and FF3F cost of equity models were originally developed from CAPM and sought to capture unsystematic risk and the pricing of assets more accurately by, for example, controlling for macroeconomic effects (e.g. rates of interest) and/or firm-specific factors(e.g. firm size). However, APT FF3F and R-L models are limited in practice due to the lack of sufficient and suitable data, and so will not be used in the present study. Second, ex-ante accounting valuation models are evaluated. The longest established ex-ante cost of equity metric is the DDM. However the DDM assumes that the cost of equity can be inferred from future dividend growth rates, which is implausible. Because of possible 'dirty surplus' items arising as a result of undeveloped Chinese accounting standards and practices up to 2007, the RIV suffers from this shortcoming and so will not be used in this study. The AEV model is particularly sensitive to the accuracy of analysts' forecasts of future long-term earnings growth which may again be problematical in an emergent market like China with an embryonic financial analyst community. On the other hand, the MPEG model derives from the AEG model but it is a more parsimonious model which has been shown to produce the most reliable and consistent estimates of the cost of equity. Consequently, the MPEG model is the preferred ex-ante cost of equity metric to be employed for comparative purposes in this study. However, the MPEG model has acknowledged limitations (e.g., the requirement for analyst forecast of EPS to be always positive). As a result, appropriate qualifications will be made in interpreting the empirical results derived from the MPEG model as well as the other cost of equity metrics analyzed. The methods adopted to test the hypotheses will be elaborated in the next chapter of this thesis.

Table 5.1: Summary of the Cost of Equity Models

Models	Assumptions	Advantages	Disadvantages
CAPM	• Investors are rational • Returns are normally distributed • Perfect competitive market	• Simple and logical model to price an individual security	• Single-factor model that might not deal with cross-temporal variations in firms' risk profiles
APT	• Investors are rational • Returns are normally distributed • Perfect competitive markets	• Incorporates macroeconomic risk factors that affect the returns.	• Requires synchronous and frequently traded share price data • Difficult to determine macroeconomic effects
FF3F	• Investors are rational • Returns are normally distributed • Perfect competitive markets	• Incorporate risk factors that control for the effects of firm size and growth prospects	• Factor betas might change over time, thus not suitable for firms with shorter return series.
R-L	• Investors are rational • Perfect competitive markets	• Captures skewness and other higher order moments of the return distribution	• Difficult to estimate the degree of investors' risk aversion.
DDM	• The industry returns cash to shareholders • Dividend payments grow at a steady rate perpetually • Fixed rate	• Simple to apply	• The assumption that dividend payments grow at a steady rate perpetually is unlikely to hold in reality
RIV	• Clean surplus	• Incorporates widely available accounting information	• Residual surplus accounting cannot be applied on per share basis
AEG	• Short-term growth rate asymptotically declines to perpetual growth rate with a rate $\delta(1\leq\delta\leq(1+Ke))$	• Empirically shown to be a more consistent (e.g., Claus and Thomas, 2001)	• Cannot fully take into account complex scenarios (e.g., the evolution of expected EPS over time)
MPEG	• The short-run growth forecast also captures the long-run future	• Empirically shown to be a more consistent estimation (e.g., Botosan and Plumlee, 2005)	• Year t+1, and year t+2 "abnormal earnings" are positive.

(Source: Various studies). This table summarizes the assumptions, advantages and disadvantages of reviewed cost of equity metrics.

CHAPTER 6. RESEARCH DESIGN

6.1 Introduction

This study uses statistical analysis to test empirically the main hypotheses put forward in Chapter 4. This chapter provides the rationale for the research approach and the manner in which it is implemented in this research project. The chapter also describes the data used in this study, defines and measures the variables used, outlines the procedure of estimating cost of equity, and specifies the models employed.

6.2 Data

This research project initially considered using all A-share companies listed at the SHSE and SZSE from 2004 to 2009 (the total no of companies was 1709 in 2009). In order to obtain detail information of property insurance purchased (e.g. coverage, deductibles, and previous claim), a survey of these A-share holding companies was conducted for each year (2004-2009). In the event, the survey and subsequent follow-ups produced a very low response rate (≤ 5% of the n = 300 sample of firms targeted).

Given the low response rate of the survey, instead of using insurance coverage and deductibles stated in the insurance policy, the annual corporate spending on property insurance scaled by the total book value of insurable physical asset is employed as a proxy for insurance coverage in this study. As in Zou (2010), corporate annual insurance expenditures are manually collected from companies' annual reports and accounts. From 1997 onwards, corporate disclosure rules in China required listed companies to itemize major financial statement items in the notes to financial statements in annual reports and some companies voluntarily reported insurance expenditure under "amortized expense items". However, the accounting disclosure rules were changed from 2007 onwards, whereby corporate insurance spending need not be separately identified under "amortized expense items". This raises the possibility of data inconsistency through the period arising changes in accounting rules (see Chapter 2, section 2.4.3). Importantly, Chinese PLCs without property insurance cannot be

identified from the annual reports and accounts. As a result, data manually collected from annual reports would potentially suffer from a sample selection bias.

In view of these data collection challenges, data on the annual insurance expenditures (as noted early in chapter 1 section 1.2, footnote 8), were obtained from a database of CIE compiled NBSC. The CIE database covers a large number of Chinese companies (approximately 15,000 companies, including a large number of listed companies). Although it does not cover all A-share listed companies, the CIE data for insurance premium reports a value of 0 if there is no property insurance purchased in a fiscal year. Therefore, the CIE dataset is not prone to selectivity bias for the purpose of the analysis conducted in the present study. Matching with the list of all A-share companies, a sample of 329 PLCs are extracted from the CIE in 2003, and 472, 422, 442 and 472 companies are extracted from CIE in 2004, 2005, 2006 and 2007 respectively[33]. Companies were manually checked to rule out financial services companies (e.g. banks, insurance companies, investment companies) because they account and report under different rules from other companies and tend to have different capital structures. Material reorganizations, such as those involving asset swaps, debt transfers, and/or divestitures among associated companies, can dramatically change a firm's asset base, capital structure and can often lead to structural industry changes (Zou 2010). Therefore, companies that experienced material reorganizations from 2003 to 2007 were also excluded. In total 2,137 firms with insurance data from 2003 to 2007 were extracted from the CIE as a base panel. It is important to note that the CIE insurance data are not consolidated compared with data collected from the annual reports and accounts. Accordingly, it is a maintained assumption of this study that firms have the same cost of equity as at group-level (see Chapter 1, section 1.6).

Company-specific share price data were extracted from Datastream and accounting information was obtained mainly from the CIE. If it is not available in the CIE, data were obtained from the Wind Financial Information System (developed by Shanghai Wind Ltd) which is a leading data provider to institutional investors in china. The two data sources (CIE and WIND) were, however, cross-checked across firms/years to

[33] Those extracted PLCs from CIE are manually checked in case of mismatch. As CIE data are compiled based on the annual financial survey conducted by the NBSB, the PLCs in the CIE may not attend survey consistently over 2003 to 2007. As noted in Chapter 1, footnote 8, insurance premiums have not been routinely collected by NBSC since 2008.

ensure data consistency. Analysts' earnings forecast data used to estimate implied cost of equity were obtained from CSMAR Securities Research Database (developed by Shenzhen GTA Ltd. and the Hong Kong Polytechnic University), which is again a dataset that is often used in academic research. The cost of equity for the final sample of 1,156 firms (out of 2,137) over 5 years (2003 to 2007) were estimated using the CAPM, and 331 firms (out of 2,137) were estimated using the MPEG method. This study thus uses an unbalanced panel of 395 firms from the period of analysis-2003 to 2007.

6.3 Statistical Procedures

This study employs three main statistical procedures to analyze the data collected and test the direction and significance of causality predicted by the two main hypotheses proposed in Chapter 5. These statistical procedures include univariate and bivariate analyses and multivariate regressions.

6.3.1 Univariate Analysis

The cross-sectional and time-series unbalanced data are first pooled and described using descriptive statistics including mean, median, standard deviation, skewness, kurtosis, minimum, maximum and number of observations.(See Chapter 7, section 7.2 Table 7.1 Panel A). This practice helps to summarize the overall characteristics of the dataset and so ascertain the patterns (e.g., the distributions) for each variable used. Second, the means and medians of firm-specific characteristics for insurance users and non-users are computed. Both parametric (t-test) and non-parametric (Wilcoxon Mann-Whitney test, hereafter WMW test) are performed to test for statistically significant differences between the means (t-test) and medians (WMW test) of these characteristics for users and non-users of property insurance. The reason for using non-parametric WMW tests as a supplement to parametric t-test equivalents is that such a test is less sensitive to the distributional differences (e.g., variance) between two sample groups. Hence it is more likely to produce robust results (Bryman and Cramer, 1997). The results of these tests are reported in Chapter 7, section 7.2 (Table 7.2 Panel A).

6.3.2 Bivariate Analysis

The bivariate analysis conducted in this study involves testing associations between the dependent and independent variables. Pair-wise Pearson correlation/Spearman rank test analyses are performed for the selected variables. Bryman and Cramer (1997) argue that an investigation of associations among variables through correlation analysis is an initial but important step in explaining the underlying phenomena in which researchers are primarily interested. Chow (1982) further indicates that from an econometric perspective, correlation analysis should be performed prior to carrying out multivariate tests in order to mitigate the risk that variable measurement errors and/or inter-correlated variables may remain undetected, and so distort the statistical significance of multivariate results. Additionally, variance inflation factors (VIFs) are performed to ascertain whether or not the coefficient estimates in the multivariate tests are potentially rendered inefficient as a result of multicollinearity (Kutner, Nachtsheim and Neter, 2004).

6.4 Models and Variables

In this section, the models used to test the hypotheses 1 and 2 are specified, and variables employed in the models are described. To investigate whether insurance purchase decision impacts on cost of equity (hypothesis 1), the following regressions model is estimated:

$$ERP\_CAPM_{i,t} = \delta_0 + \delta_1 INS_{i.t} + \delta_2 LEV_{i,t} + \delta_3 LnMV_{i,t} + \delta_4 LnMB_{i,t} + \delta_5 CASH_{i,t} + \delta_6 NSHARE_{i,t} + \alpha_i + \beta_t + \varepsilon_{i,t} \quad [6.1]$$

where:

ERP_CAPM = estimated equity risk premium (proxy for the cost of equity) produced by CAPM;
INS = insurance purchase decision;
LEV = leverage;
LnMV = firm size (logarithm of market value of equity);
LnMB = logarithm of market to book ratio, price-to-book;
CASH = liquidity risk;
NSHARE = proportion of non-tradable share;
α = industry dummies, industry fixed effect;
β = year dummies, year fixed effect; and
ε = error term.

Furthermore, to investigate the relation between the amount of insurance and cost of equity (hypothesis 2), the following regression equation [6.2] is employed

$$ERP\_CAPM_{i,t} = \delta_0 + \delta_1 INSCOV_{i,t} + \delta_2 INSCOV_{i,t}^2 + \delta_3 LEV_{i,t} + \delta_4 LnMV_{i,t} + \delta_5 LnMB_{i,t} + \delta_6 CASH_{i,t} + \delta_7 NSHARE_{i,t} + \alpha_i + \beta_t + \varepsilon_{i,t} \quad [6.2]$$

where the variables are as defined in equation [6.1], except for:

INSCOV = the extent of property insurance or insurance coverage;
$INSCOV^2$ = square of insurance coverage.

6.4.1 Dependent Variable

The equity risk premium (proxy for the cost of equity: *ERP_CAPM*) is the dependent variable in above regression model and is estimated using the CAPM (see equation [5.1]). Two versions of *ERP_CAPM* are used in the regression model and produced by raw beta regressed from the market model and the industry-adjusted beta respectively. In the CAPM, only beta varies across companies, the market risk premium (defined as the difference between $E(R_m)$ and r_f), is deemed to be the same to all companies in the panel. The cost of equity can be specified as $ERP_i = \beta_i \times$market risk premium: more specifically, $ERP_i = \beta_i \times [E(R_m) - r_f]$. Therefore, in order to obtain ERP, beta, and market risk premium need to be estimated.

6.4.1.1 Estimating the Beta

Since beta cannot be observed directly, the value must be estimated. The most common metric used to estimate a company's raw beta is the market model: i.e., $R_i = \alpha + \beta R_m + \varepsilon$ [6.3]. In the market model (equation [6.3]), the stock's return R_i, is regressed against the market's return R_m. In this study, a specific share's return i is calculated as discretely compounded adjusted prices (e.g., dividend, right issue): i.e., $(R_t = P_{t+1} - P_{it}/P_{it})$. As the true market portfolio is unobservable, the value-weighted return on SZSE and SHSE is used as a proxy for market's return and derived using the following formula:

$$\left(\frac{MC_{SZ}}{MC_{SZ} + MC_{SH}}\right) \times \left(\frac{SZIndex_{t+1} - SZIndex_t}{SZIndex_t}\right) + \left(\frac{MC_{SZ}}{MC_{SZ} + MC_{SH}}\right) \times \left(\frac{SHIndex_{t+1} - SHIndex_t}{SHIndex_t}\right) \quad [6.4]$$

where *MCSZ* = market capitalization of SZSE;
MCSH = market capitalization of SHSE;

SZIndex = price index of SZSE; and
SHIndex = price index of SHSE.

To run the regression, previous 60 months data are used (e.g, see Cummins and Phillips, 2005). The measurement period for the raw regressions included at least 24 data points (24 month returns). Koller, Geodhart and Wessel (2004) argued that using high-frequency data such as daily or weekly returns could be problematical when shares are rarely traded. An illiquid security can have many reported returns equal to zero, not because its value is constant but because it has not been traded. Consequently, estimates of beta on illiquid securities tend to be biased downwards. Koller et al. (2004) further pointed that another problem with using high-frequency data is the 'bid-ask bounce'. Periodical share prices are recorded at the last trade date, and the recorded price depends on whether the last trade was a purchase (using the ask-price) or a sale (using the bid-price). Therefore, a distortion in beta estimation can be caused by a security whose intrinsic value remains unchanged and only 'bounces' between the bid and ask prices. (Corsi, Zumbach, Muller, and Dacorogna, 2001)

To improve the precision of the beta estimation, industry-adjusted company betas were calculated, and as in Koller et al. (2004) a four-step process was employed. First, each company's raw beta was unlevered. A company's raw beta is reflected not only by its operating risk, but by the financial risks it takes. A company with more debt faces greater financial risks, and the increase in such risks is reflected in the beta. Therefore, to compare companies with similar operating risks (i.e., to obtain an industry beta), the effect of leverage needs to be removed. To undo the effect of leverage, the raw beta is divided by a leverage factor based on a company's market-debt-to-equity ratio at time t (1+long term debt/market value of equity). Second, the industry unlevered beta is obtained by calculating the median of unlevered beta for each industry-year. Third, the industry unlevered beta is re-levered to each company's target debt-to-equity ratio (using market values at time 2010 as proxies[34]). Finally, the re-levered beta is

[34] A company's target debt-to equity ratio is not directly observable and current market values are usually used as proxies (Koller et al., 2004). The reason to use market value at time 2010 is that the market values in 2011 in China are unlikely to reflect companies' true target capital structures due to significant impact of economic intervention from the government.

'smoothed' using the Bloomberg's formula for industry-adjusted company beta = 0.33+0.67(re-levered beta)[35].

6.4.1.2 Estimating the Market Risk Premium

How to quantify the market risk premium is one of the most debated issues in finance (Koller et al., 2004). Indeed, there is no well-accepted model for estimating the market risk premium (Koller et al., 2004). Basically, methods to estimate the market risk premium fall into three general categories. First, involves estimating the future risk premium by measuring and extrapolating historical returns. Second, regression analysis is employed to link current financial market variables, such as the aggregate dividend-to-price ratio, to project the expected market risk premium. Third, accounting-based valuation techniques are used, along with estimates of the return on investment and growth, to 'reverse engineer' the market's cost of capital.[36]

None of these models, however, precisely estimates the market risk premium. The use of current financial ratios, such as the aggregate dividend-to-price ratio, the aggregate book-to-market ratio, or the aggregate ratio of earnings to price, to estimate the expected return on stock is well documented. Many prior studies have tested this concept (e.g., Fama and French, 1988; Stambaugh, 1999; Lewellen, 2004). However, for an emerging market, such as China, having a relatively short history (20 years or so) and high volatility of share prices, the market risk premium estimation using the 'ratio method' could be negative. However, a negative risk premium is inconsistent with the appetite of risk-averse investors who require a return for the risk undertaken. The use of the reverse-engineering model by employing analysts' earnings forecasts to estimate implied market risk premium is known to be optimistic (upward-biased)(Easton and Sommers, 2007). Therefore, in present study, historical data are used to estimate past record market risk premiums. The rationale is that the risk aversion of investors in China has not significantly changed over the past 20 years (Zheng et al., 2008). As a result, the use of historical excess returns should be a reasonable proxy for future premiums. Here the market risk premium is calculated as average of value-weighted

[35] Bloomberg's smoothing mechanism is in the spirit of Blume's (1975) study, which suggests betas revert to the mean. Therefore, this formula reduces extreme betas towards the overall average.

[36] Such accounting-based valuation models include the dividend capitalization model reported in Botosan(1997); the residual income valuation model in Gebhardt et al. (2001), and Claus and Thomas (2001); and the abnormal earnings growth model used in Gode and Mohanram (2003).

excess return on SZSE and SHSE stocks relative to the one-year Chinese government bond rate from 1992 to 2008 (The longest data series that are available on Datastream and CSMAR). Although long-term government bonds better match the duration of a company's cash flows than do short-term bonds, long-term government bonds in China, such as 10-year Chinese government bond tends to be illiquid (Zheng et al., 2008). Therefore, the annual Chinese government bond rate is used in the present study. The annual average excess return computed in this way is 7% per annum.

6.4.2 Independent Variables

The independent variable (*INS*) in equation [6.1] represents the insurance purchase decision, and is measured as a dummy variable, equals to 1 if firms purchase insurance, and 0 otherwise. The independent variable (*INSCOV*) in equation [6.2] is a continuous variable that denotes the financial extent of property insurance use by Chinese PLCs. *INSCOV* is defined as the annual (amortized) corporate spending on property insurance scaled by the prior year-end book value of tangible assets (e.g. fixed assets and inventory). The measurement of *INSCOV* is consistent with prior studies (Hoyt and Khang, 2000; Zou and Adams, 2008a; Zou, 2010; Jia, et al., 2011; Jiang, et al., 2012). However, it is worth noting that Aunon-Nerin and Ehling (2008) report that this measurement does not directly reflect the extent of asset coverage and so it can be a "noisy" proxy for the proportion of assets covered by insurance because insurance premiums may be affected by other factors(e.g., deductibles and different risk profiles assets). However, as noted earlier (in section 6.2), insurance data other than annual paid out insurance premiums are not available from public sources and so represents an unavoidable limitation of this research project. Another independent variable ($INSCOV^2$) enters model [6.2], and is the square of annual corporate spending on property insurance scaled by the prior year-end book value of tangible assets.

6.4.3 Control Variable

As noted in Chapter 4 (section 4.3.1) the cost of equity can be influenced by firm-specific factors. Therefore six firm-related risk characteristics are included as control variables, namely: firm size (*LnMV*), the price-to-book (*LnMB*), leverage (*LEV*),

liquidity (*CASH*), share ownership type (*NSHARE*) and industry-effects ($INDUS_{1\text{-}18}$). The variables are defined and briefly motivated below.

Firm size (*LnMV*) is defined as natural logarithm of the market value of equity, measured at the end of the fiscal year. The inverse relation between firm size and cost of equity is expected as Berk (1995) argues that market value and total firm-specific risk are inherently negatively related.

Price-to-book (*LnMB*) is the natural logarithm of the ratio of the market value of equity-to-book value of equity. Both the numerator and denominator are measured at the end of the fiscal year. Prior research has found mixed evidence on the relation between growth opportunities and cost of equity. Chung and Charoenwong (1991) observe a positive relation between equity risk and firm's growth opportunities in the US corporate sector. Berk (1995) argues that price-to-book values are negatively associated with the cost of equity, as price-to-book is positively related to the market value of equity and as a result, it is negatively related to total firm risk. From their US study, Botansan and Plumlee (2005) contend that price-to-book values are positively linked with the market value of equity. However, their research shows that price-to-book values are positively related to market betas, and thus positively linked with the cost of equity. Therefore, no clear prediction is made for the relation between the cost of equity and price-to-book values.

Leverage (*LEV*) is represented by the long-term debt to total assets ratio, measured at the end of the fiscal year. Modigliani and Miller (1958) suggest that an increase in the level of debt in a firm's capital structure causes an increase in financial risk (insolvency) that can threaten the ability of the firm to remain a going concern. Zou (2010) contends that leverage may also affect firm value through magnifying business operating risk. Therefore, a positive relation between leverage and the cost of equity is predicted.

Liquidity risk (*CASH*) is measured as cash and cash equivalent scaled by the book value of total assets measured at the end of the fiscal year. *CASH* is an inverse proxy for liquidity risk: the greater the value of *CASH*, the lower liquidity risk and vice versa. Firms with better liquidity position (more cash) are likely to invest in positive NPV project and so less prone to the 'investment crowding-out' problem (see Chapter 3,

Table 3.2). Therefore, a negative relation between *CASH* and the cost of equity is expected.

NSHARE is defined as the proportion of non-tradable A-shares to total shares in issue. As mentioned in Chapter 2 (section 2.3.1), controlling-minority shareholder incentives conflicts are potentially acute in China due to the split-share structure in many PLCs (Zou et al., 2008). Non-tradable shareholders' interests are not directly affected by changes in market share prices while tradable shareholders' interests are influenced by such changes. Additionally, concentrated ownership structure gives non-tradable shareholders in Chinese PLCs the potential to dominate firm decisions and benefit themselves at the expense of minority shareholder interests. Therefore, investors would in all probability perceive the risks of such potential 'tunneling' activities to be high and thus require higher returns in such cases. Consequently, the extent of non-tradable share held by PLCs is likely to be a reasonable proxy of the degree of controlling-minority shareholder incentive conflicts that might affect the cost of equity in China. From the prior literature, a positive relation between *NSHARE* and *ERP* (the proxy for the cost of equity) is predicted.

In this study, industry dummies (*INDUS* $_{1\text{-}18}$) are also included in the regression analysis to control for industrial factors that are likely to affect a firm's cost of equity. The 2010 WIND industry classification system is used to divide firms by industry type (see Appendix A). Time dummies are also used to capture time-related market and macroeconomy-wide factors that are common to all sample firms.

6.5 Alternative Estimate of ERP-the MPEG Model

As a robustness test, an alternative measure of the cost of equity is used based on the modified PEG model of Easton (2004), where the ERP is implied by analysts earning forecast data. Therefore an alternative specification to that noted equation [6.1] is:

$$\begin{aligned} ERP\_MPEG_{i,t+1} = {} & \delta_0 + \delta_1 INS_{i.t} + \delta_2 LEV_{i,t} + \delta_3 LnMV_{i,t} + \delta_4 LnMB_{i,t} + \delta_5 CASH_{i,t} + \\ & \delta_6 NSHARE_{i,t} + \delta_7 UBETA_{i,t+1} + \delta_8 STD\_ERR_{i,t+1} + \delta_9 FERR_{i,t+1} + \\ & \delta_{10} LnRET12_{i,t+1} + \alpha_i + \beta_{t+1} + \varepsilon_{i,t+1} \end{aligned} \quad [6.5]$$

where: *ERP_MPEG* = implied equity risk premium (an alternative proxy for the cost of equity) produced by MPEG at t+1 conditional on information at time t;
INS = insurance purchase decision;
LEV = leverage;
LnMV = firm size (logarithm of market value);
LnMB = logarithm of market to book ratio, price-to-book;
CASH = liquidity risk;
NSHARE = proportion of non-tradable share;
UBETA = unlevered beta;
STD_ERR = idiosyncratic return volatility;
FERR = analysts' forecast error;
LnRET12 = price run up
α = industry dummies, industry fixed effect;
β = year dummies, year fixed effect; and
ε = error term.

Furthermore, to investigate the relation between amount of insurance and cost of equity and alternative specification to equation [6.2] is employed namely:

$$\begin{aligned} ERP\_MPEG_{i,t+1} = {} & \delta_0 + \delta_1 INSCOV_{i.t} + \delta_2 INSCOV_{i,t}^2 + \delta_3 LEV_{i,t} + \delta_4 LnMV_{i,t} + \delta_5 LnMB_{i,t} \\ & + \delta_6 CASH_{i,t} + \delta_7 NSHARE_{i,t} + \delta_8 UBETA_{i,t+1} + \delta_9 STD\_ERR_{i,t+1} + \\ & \delta_{10} FERR_{i,t+1} + \delta_{11} LnRET12_{i,t+1} + \alpha_i + \beta_{t+1} + \varepsilon_{i,t+1} \end{aligned} \quad [6.6]$$

where the variables are defined as in equation [6.5], except for
INSCOV = the extent of property insurance or insurance coverage;
INSCOV^2 = square of insurance coverage.

6.5.1 Dependent Variable

The dependent variable in the above models [6.5] and [6.6] is an alternative proxy for the cost of equity (implied equity risk premium: *ERP_MPEG*) that equals the ex-ante implied cost of equity estimated by the MPEG model minus the risk-free rate which is defined as the yield to maturity of one-year zero coupon rate for a Chinese government bond. *ERP_MPEG* is derived from the following formula:

$$ERP\_MPEG = A + \sqrt{A^2 + (eps_{t+2} - eps_{t+1})/P_t} - rf_t, A = DPS_1/(2P_t) \quad [6.7]$$

where eps_{t+2} and eps_{t+1} = earnings per share forecast one and two year ahead of year t;
DPS_t = dividend per share at year t;
r_{ft} = yield to maturity of zero coupon one year Chinese government bond at year t.

Analysts' forecasts for EPS are obtained from the CSMAR database. However, matching firms with those extracted from CIE data and after dropping cases where *eps*

$_{t+1}$ and eps_{t+2} are negative meant that only 331 *ERP_MEPG* values are obtained throughout the five years, 2003-2007.

6.5.2 Other Variables in the Regression

The main independent variables are *INSCOV* and $INSCOV^2$ and are as defined above in models [6.5] and [6.6]. The control variables are also as defined previously (in section 6.4.3) However, four more control variables-namely, unlevered beta(*UBETA*), idiosyncratic risk (*STD_ERR*) analysts' forecast error (*FERR*), and price run-up (*LnRET12*) are added in the MEPG model regression in equation [6.5] and [6.6].

Systematic Risk is defined as unlevered beta (*UBETA*) and measured by the raw beta estimated from market model regression using the previous 60 monthly returns (at least 24 monthly observations) divided by one plus the ratio of long-term debt to market value of equity as described in the second step for estimating industry-adjusted beta noted earlier in section 6.4.1.1. Botosan and Plumlee (2005) report that the rationale for using the unlevered beta is argue that when levered beta is included in the model, the interpretation of the coefficient estimate is unclear because the levered beta captures leverage risk as well as market risk. The coefficient estimate on *UBETA* is expected to be positive if systematic risk increases the yield demanded by equity holders (Botosan and Plumlee, 2005).

Idiosyncratic risk (*STD_ERR*) is also controlled for in the regression model. It is defined as the risk that is unique to a particular firm, so it is also called firm-specific risk. By definition, idiosyncratic risk is independent of the common movement of the market. Modern portfolio theory suggests that investors hold a portfolio of stocks to diversify idiosyncratic risks. As a result, only systematic risk is priced and idiosyncratic risk is not (Doherty, 2000, p. 88). However, Merton (1987) suggests that idiosyncratic risks can be priced when investors do not hold diversified portfolios. Drawing evidence from the SHSE, Drew, Naughton and Veeraraghavan (2004) show that idiosyncratic volatility is priced in share value. Following Chen, Huang and Wei (2013), idiosyncratic risk is measured as the standard deviation of the residual monthly returns in market model regression using the previous 60-month stock returns (at least 24 months). Based on the prior literature (e.g., Drew et al., 2004) a positive relation between idiosyncratic risk and the cost of equity of Chinese PLCs is predicted, all else being equal.

Prior studies shows that analyst's earnings forecasts (*FERR*) can be systematically biased, with the direction and magnitude of the bias correlated with various firm-year characteristics (e.g., see Guay et al. 2005; Hughes, Liu and Su, 2008). Using biased earnings forecasts as inputs in the valuation equation inevitably produces biased implied cost of equity estimates. For example, Easton and Sommers (2007) suggest that the implied cost of equity estimated by analysts' forecast is well known to be optimistic thus yielding upward biased estimators. Therefore, to control for the effect of such bias, analysts' forecast error is included to control for the effect of forecast optimism. Following the study of Chen et al. (2013), forecast error is defined as the difference between actual EPS and forecast EPS. When actual EPS from WIND is missing, the actual EPS value obtained from DataStream is used. A negative relation between *FERR* and the cost of equity (*ERP_MPEG*) is predicted.

To mitigate the possibility of analysts' sluggishness in processing information (Nekrasov and Ogneva, 2011), price run-up during the previous 12 months (denoted as *LnRET12*), is calculated as the natural logarithm of one plus the compounded stock returns in the previous 12 months. A negative relation between price run-up (*LnRET12*) and the cost of equity (*ERP_MPEG*) is predicted.

6.6 Endogeneity

The endogeneity of insurance has always been a major concern in the studies of the economic consequences of insurance decisions (Zou 2010). Robustness tests are therefore conducted to address potential endogeneity problems.

First, it is possible that poor corporate governance leads to both poor risk management (i.e., the purchase no insurance or purchase low levels of insurance) (e.g., see Adams, et al., 2011) and a high cost of equity. To address this concern, three key corporate governance variables are included in the baseline regression. These variables aim to capture corporate governance quality and are:

Board size (*BOARD_SIZE*) is defined as the number of board members. The board of directors' role is to provide independent oversight of management and hold management accountable to shareholders for its actions. Large boards can bring in additional expertise, extensive business and political network and increased monitoring capacity and reduce agency cost (Fan, Wong and Zhang, 2007). Therefore, shareholders should price securities lower for the return trade-off arising from sound governance systems. Accordingly, all else eual, a well-governed firm's cost of equity should be lower than that of a poorly governed firm. However, a large board might be ineffective in improving firm performance and resolving agent incentive conflicts - for example, because of conflicting decision-making amongst board members (Jensen, 1993). As a result, no prior prediction of the impact of board size on the cost of equity is made.

Board independence (*IND_BOARD*) is the ratio of independent board members to board members. Fama and Jensen (1983) suggested that independent directors are likely to be motivated to act independently and prudently in their role as risk monitors, so as to maximize the value of their human capital in the external labour market. Better monitoring of managerial decision-making can further lower the degree of managerial entrenchment and opportunistic behavior and so enhance a firm's financial performance. Thus, shareholders are likely to seek less price protection for firm-specific and systematic risks, and so lower the cost of equity. Therefore, other things being equal, a negative relation between percentage of independent outside directors and cost of equity is predicted.

CEO duality (*CEO_CHAIR*) is an indicator variable that takes value of 1 if the CEO is also the Chairman and 0 otherwise. Hermalin and Weisbach (1991) advocate separating the CEO and chairman functions as it facilitates effective internal monitoring and control and reduces the likelihood of excessive risk-taking (and hence raising equity costs). In contast, Brickley, Coles and Jarrell (1997) contend that a single individual as CEO and Chairman brings advantages, such as sure-footed decision-making and a centralized system of organizational control. Therefore, no prior prediction of impact of CEO duality on the cost of equity is made.

Second, to further address potential endogeneity, an instrumental variable (IV) regression approach that treats *INS* and *INSCOV* as endogenous is also employed. The

method of instrumental variables (IV) provides a possible solution to the problem of an endogenous explanatory variable (Wooldridge, 2002). Specifically, *INS* is instrumented by equation [6.8], and its fitted value (*INS**) is incorporated as an explanatory variable into equation [6.1].

$$INS_{it} = \delta_0 + \delta_1 HPR\_FIRM_i + \delta_2 CITYDUM_i + \delta_3 COD_{it} + \delta_4 CAPX_{it} + \delta_5 MAN\_OWN_{it} + \delta_6 STATE\_OWN_{it} + \delta_7 ASSTAN_{it} + \delta_8 LEV_{it} + \delta_9 ASSTAN \times LEV_{it} + \delta_{10} LnMV_{it} + \delta_{11} LnMB_{it} + \delta_{12} CASH_{it} + \delta_{13} NSHARE_{it} + \alpha_i + \beta_t + \varepsilon_{it} \quad [6.8]$$

where *HRP_FIRM* = firms having high property risk;
CITYDUM = firms locating in place where suffer high natural disastrous risk;
COD = cost of borrowing;
CAPX = Capital expenditure to total asset;
MAN_OWN = the proportion of total shares in issue held by managers;
STATE_OWN = the proportion of total shares in issue held by state;
ASSTAN = asset tangibility;
LEV = leverage; and
Other variables are defined as in the equation [6.1]

The IV regression procedure employed is a two-stage process. First, three instrument variables for corporate insurance purchase decision are used[37]:

High risk firms (*HRP_FIRMS)* is a dummy variable denoted 1 if a firm belongs to an industry that faces inherently high accidental risks to assets and so likely to purchase property insurance, and 0 otherwise. Industries facing high accidental risk include businesses such as manufacturers of chemicals, plastics and rubber, oil and gas extraction/refining, coal mining, and metallurgical engineering. However, this dummy variable does not capture the level of a firm's future expected cash flows. Therefore, it is not expected to closely match cost of equity levels.

High risk location (*CITYDUM*) is a dummy variable denoted 1 if a firm locates in the place which faces severe environmental hazards (e.g. flooding, earthquakes etc.), and 0 otherwise. More specifically, a firm located on the east coast or central China (locations particularly susceptible to severe environmental hazards such as storms and flooding) is denoted 1, and 0 otherwise. There is no a priori relation between this dummy and the cost of equity.

[37] The endogenous variable (the insurance purchase decision) is a binary variable, and instrumental variables for insurance purchase decision are two binary variables and one continuous variable. However, Wooldridge (2002, p.84) contend that, one or both of endogenous variable and instruments can be binary variables, or have continuous and discrete characteristics at the same time.

Cost of borrowing (*COD)* is the cost of borrowing and incorporated as a third instrument in the analysis. Zou and Adams (2008a) postulate that Chinese firms with higher costs of borrowing tend to purchase property insurance to facilitate borrowing. *COD* is defined as a firm's average borrowing cost (i.e., interest expense charged to the income statement/book value of total debt).

Second, following prior studies (e.g. Hoyt and Khang,2000; Mayer and Smith, 1982; Zou and Adams,2006), the capital expenditure to asset ratio (*CAPX*), State ownership (*STATE_OWN*) and managerial ownership (*MAN_OWN*) and tangible assets (*ASSTAN*) are also included as control variables.

CAPX is defined as annual capital expenditure over total assets. Smith and Watts (1992) argue that relative to firms with few growth opportunities, firms with greater growth options tend to be riskier as their managers are normally given more discretion over investment decisions. Consequently, managerial decisions in firms with high growth prospects might be less transparent to outside parties than other firms thus potentially increasing agency costs. Therefore, it is expected that, other things being equal, managers of high growth firms are likely to have greater incentives to purchase property insurance than their counterparts in firms with fewer growth prospects.

Zou and Adams (2006) contend that in the Chinese corporate sector State ownership (*STATE_OWN*) could exacerbate agent-principal incentives conflicts because of the general and a lack of incentives for delegated State agencies (bureaucracies) to closely monitor managers in the companies that they oversee. Browne and Hoyt (2000) suggest that managerial incentives to purchase property insurance to manage asset-loss risks (and so control agency conflicts) could be reduced where the State is a major shareholder. This is because the State bears the full economic and social welfare costs arising from the adverse consequences of risky managerial decisions. However, Jia et al. (2010) argue that firms with highly concentrated State-owned shareholdings could buy more property insurance as their majority State shareholders could have less diversified interests outside of the firm compared with other investors. Therefore, no prior prediction is made for *STATE_OWN*.

There are two competing hypotheses regarding the influence of managerial ownership on the corporate purchase of insurance in the finance literature, namely the managerial risk-aversion and incentive-alignment hypotheses. For example, Smith and Stulz (1985) argue that as insider ownership increases managers are expected to become increasingly risk averse because they have a greater economic interest invested in the company. As a result, managers are more likely to engage in risk management (purchase property insurance). On the other, hand, Saunders, Strock and Travlos (1990) propose their incentive alignment hypothesis, which suggests that as insider ownership increases, managers' economic interests become more closely aligned with those of shareholders. As a result, managers could be motivated to increase the level of business risk and/or engage in less risk management activity (not purchase property insurance) in order to economize on operating risks.

Tangible-asset (*ASSTAN*) is also included as a control variable. Intuitively, firms with more tangible productive assets are more like to purchase insurance (Zou et al., 2003; Zou and Adams, 2006, 2008a). In addition, to control for the possibility that the correlation between leverage and property insurance is conditional upon a firm's tangible assets, the interaction between leverage and tangible asset intensity is include in the regression. Both variables are centered on their mean (mean is subtracted from the original value) before constructing the interaction term in order to avoid possible multicollinearity between the interaction term and the component variables (e.g. see Jaccard, Turrisi, and Wan, 1990).

INSCOV is instrumented in equation [6.9]. Then its fitted value (*INSCOV**) is incorporated as an explanatory variable into equation [6.2].

$$\begin{aligned} INSCOV_{it} = {} & \delta_0 + \delta_1 INSCOV\_INDUS\_CITY\_MEDIAN_{it} + \delta_2 CAPX_{it} + \\ & \delta_3 MAN\_OWN_{it} + \delta_4 STATE\_OWN_{it} + \delta_5 ASSTAN_{it} + \delta_6 LEV_{it} \\ & + \delta_7 ASSTAN \times LEV_{it} + \delta_8 LnMV_{it} + \delta_9 LnMB_{it} + \delta_{10} CASH_{it} + \\ & \delta_{11} NSHARE_{it} + \alpha_i + \beta_t + \varepsilon_{it} \end{aligned} \qquad [6.9]$$

where *INSCOV_INDUS_MEDIAN* = industry median of insurance coverage.

Following recent studies (Adams et al., 2011; Jiang et al., 2012) the industry median *INSCOV* in the same city excluding the firm in question in the same year is used as an instrument for insurance coverage (*INSCOV*). Industry classification is based on the

2010 WIND industrial sector categories. City is categorized into 7 regional locations, namely east, north-east, west, central, south, south-west, and north-west. Conceptually, Chinese firms operating in the same industry and geographical location are expected to have similar levels of property risk. Therefore, the instrument should be correlated with a firm's property insurance coverage but it is unlikely to directly influence a firm's cost of equity except through the firm's property insurance[38]. Other variables are same as in equation [6.8].

6.7 Model Specification and Variables for Hypothesis 3

The following procedure is adopted to test hypothesis 3-namely that whether the reduction of the cost of equity through insurance results from mitigating agency problems such as investment project investment crowding-out and/or managerial risk aversion between shareholders and managers.

First, *CAPX* is regressed on *INSCOV*, where capital expenditure-to-total asset ratio (*CAPX*) is taken as an inverse proxy for investment crowding-out and/or managerial risk, and controlling for other factors[39]. More specifically, the model is shown in equation [6.10] below:

$$CAPX_{it} = \delta_0 + \delta_1 INSCOV_{it} + \delta_2 NDF_{it} + \delta_3 CS_{it} + \delta_4 LnMB_{it} + \alpha_i + \beta_t + \varepsilon_{it} \quad [6.10]$$

where *NDF* = New debt financing, defined as (total liabilities in year t+1 minus total liabilities in year t)/total assets in year t (see Zou (2010));
CS = Cash flow to sales ratio, defined as (EBITA-tax)/Sales; and
Other variables are the same as in equation [6.1] and [6.2].

Agency theory suggests that insurance can facilitate investment in positive NPV projects when firms face a set of investment opportunities. In other words, firms with insurance or a relative higher level of insurance are likely to suffer less from investment crowding-out and/or managerial risk aversion. Therefore, a positive relation between property insurance use and *CAPX* is expected. Following Zou (2010), *NDF* and *CS* are included as control variables. Price-to-book (*LnMB*)-an inverse proxy for the investment

[38] This is the reason of removing the firm in question in computing the median *INSCOV* and controlling for industry fixed-effects.

[39] The relation between property insurance use and the cost of equity is unlikely to be driven by the endogeneity problem of insurance, if the results are consistent with main hypotheses 1 and 2 after conducting the robustness test. Therefore, tests of hypothesis 3 stated in chapter 4 section 4.3.2 will be based on the original *INSCOV*.

opportunities-is also included. A positive relation between *CAPX* and *NDF* and *CS*, and a negative linkage with *LnMB* are predicted. Second, if the results of the first-step regression analysis are consistent with what is hypothesized, then *CAPX* will be included in the baseline equation [6.1] to test whether the investment crowding-out and/or managerial risk aversion are priced in the cost of equity. The rationale for this procedure is to capture the impact of property insurance on resolving those agency problems in the first step, and then examine what the impact of those problems on the cost of equity in the second-step. Put another way, if there is indeed a positive linkage between property insurance use and *CAPX* in the first-step and a negative relation between *CAPX* and the cost of equity in the second-step, then it is likely that the reduction of the cost of equity results from the role of property insurance in mitigating agency incentive conflicts, such as the investment crowding-out and/or managerial risk aversion problems.

6.8 Summary and Conclusions

This chapter describes the dataset used and the period covered by the empirical analysis. The study uses data from the CIE database complied by the NBSC. The final sample comprises 1,156 firm/year observations over the period of 2003 to 2007. This chapter also describes the research design, including statistical procedures, model specification, definition of variables used to test the hypotheses put forward in Chapter 4, and especially, the estimation of the dependent variable. This chapter raises the possibility of variable endogenity and so describes the robustness checks utilized to mitigate such a concern. The empirical results obtained from models specified in this chapter are now analyzed and discussed in the next chapter of this thesis.

CHAPTER 7. EMPIRICAL RESULTS

7.1 Introduction

The use of agency theory for explaining the linkage between the cost of equity and property insurance for PLCs has been examined in Chapter 4 of this thesis. From this analysis, the three hypotheses that are put forward in Chapter 4 and the control variables noted in Chapter 6 are now tested using the statistical procedures described in Chapter 6. The remainder of this chapter is organized as follows. Section 7.2 discusses the univariate results and section 7.3 presents the bivariate results that are computed using Pearson and Spearman correlation analysis. Section 7.4 reports the multivariate results, while section 7.5 presents the robustness checks. Finally, section 7.6 concludes this part of the thesis.

7.2 Univariate Results

Panel A of Table Table 7.1 gives the descriptive statistics for the dependent and explanatory variables for the pooled company/year sample of China-based PLCs for the period 2003-2007. The equity risk premium (*ERP_CAPM RAW BETA*) ranges from 2% to 13% and from 4% to 17% after being adjusted by industry (*ERP_CAPM INDUSTRY-ADJUSTED BETA*). The dispersion is much wider than for US PLCs reported in Fama and French (2002) which is from 2% to 7% and for UK PLCs that vary between 2% to 5% as noted in Dimson, Marsh and Staunton (2003). This suggests that the emerging Chinese stock market is more volatile than developed Western stock markets. While the average equity risk premium estimated by CAPM (*ERP_CAPM*) in this study is around 7%, the alternative measure for the average equity risk premium computed using the MPEG (*ERP_MPEG*) is 5.5%. Such a variation could, however, reflect differences in sample size. In the present study, the average annual property insurance spending (*INSCOV*) is around 0.4% relative to firms' tangible assets. This percentage is 0.1% and 0.2% higher than those reported in the Zou and Adams (2006) and Zou (2010) respectively, suggesting an increase in commercial property insurance spending by Chinese PLCs in recent years. However, average insurance spending is 0.1% lower than that reported for US and Canadian firms surveyed in 1999 by MacMinn and Garven (2000). Therefore, although property insurance is a common risk management tool in Chinese companies, the level of spending is relatively lower than that of Western

companies. In order to gain some idea of the economic significance of such insurance spending, the approach of Adams et al. (2011) and Jiang et al. (2012) is followed whereby the median property insurance intensity is divided by 0.3% to derive the approximate percentage of the sum insured relative to the value of the beginning-of-period tangible assets. The proportion covered is about 18% which is substantially lower than the figure of 93.8% reported for example, in Jiang et al.'s (2012) study which included a large number of unlisted small and medium size entities (SMEs)[40]. This observation suggests that relatively bigger and publicly quoted companies in China are more likely to retain property risks on their balance sheet compared with SMEs.

For the corporate governance variables, the average number of non-tradable shares issued by firms (*NSHARE*) in the sample is approximately 50%, suggesting the possibility of controlling-minority shareholders' incentive conflicts as previously mentioned in Chapter 6 section 6.4.3. Regarding ownership, the average shareholdings of the State (*STATE_OWN*) and insiders (*MAN_OWN*) are 30% and 0.02%, respectively. Managerial ownership is 0.04% and 0.05% lower than that reported in Zou and Adams (2006) and Zou (2010) respectively, while the degree of State-ownership is similar to these studies. This suggests the possibility of a gradual change in the nature of managerial compensation schemes in Chinese PLCs over the last five years or so. The mean (median) of board size for Chinese PLCs in the current dataset is around 10 and the standard deviation is 2.08, suggesting relatively small variation in the size of corporate boards across firms in the sample.

Panel B of Table Table 7.1 shows the equity risk premium (proxy for the cost of equity) and insurance coverage in different percentiles. The bottom 10 percentile of Chinese firms in the dataset spent nothing on property insurance during sample year. The equity risk premium estimated by MPEG (*ERP_MEPG*) is 0.7% and is significant lower than that estimated by CAPM (*ERP_CAPM*) in 10 percentile. Again, such a big gap could be due to differences in sample size rather than differences in the estimation method used.

[40] Adams et al. (2011) and Jiang et al. (2012) reported that about 0.3% is roughly the mean of the premium rates changed by PICC (a major insurance provider in China) on an average industrial business during the sample period This admittedly crude estimate might be confounded by large scale under/misvaluations of firm value, however, 18% is not an insignificant figure.

Table 7.1: Chinese PLCs, 2003-2007: Descriptive Statistics
Panel A: Summary Statistics

Variables	Mean	Median	Std. Dev.	Skewness	Kurtosis	Min	Max	N
ERP_CAPM(RAW BETA)	0.071	0.071	0.013	0.012	4.102	0.022	0.126	1,156
ERP_CAPM(INDUSTRY-ADJUSTED BETA)	0.071	0.069	0.009	4.426	6.858	0.043	0.170	1,156
ERP_MPEG	0.055	0.031	0.061	1.574	3.162	0.012	0.306	331
INS	0.779	1.000	0.415	-1.348	2.816	0.000	1.000	1,156
INSCOV	0.004	0.001	0.014	3.716	17.959	0.000	0.046	1,156
$INSCOV^2$	0.000	0.000	0.003	5.809	39.126	0.000	0.002	1,156
LEV	0.070	0.032	0.092	2.090	9.373	0.000	0.829	1,156
CASH	0.140	0.115	0.099	1.313	5.248	0.000	0.642	1,156
LnMB	0.951	0.803	0.777	1.226	6.944	-0.821	6.631	1,156
LnMV	21.414	21.270	0.981	1.097	5.159	19.277	26.445	1,156
UBETA	0.941	0.934	0.275	0.147	3.954	0.468	1.680	1,156
STD_ERR	0.203	0.184	0.095	7.407	29.991	0.071	2.051	1,156
NSHARE	0.516	0.548	0.170	-0.929	4.063	0.000	0.826	1,156
FERR	-0.030	0.000	0.183	-3.304	24.685	-1.774	1.124	331
LnRET12	0.047	0.000	0.439	-0.481	4.905	-2.289	1.206	1,156
STATE_OWN	0.300	0.324	0.232	0.052	1.738	0.000	0.850	1,156
MAN_OWN	0.002	0.000	0.030	16.858	306.477	0.000	0.643	1,156
BOARDSIZE	9.685	9.000	2.080	0.764	4.512	3.000	18.000	1,156
INDBOARD	0.333	0.333	0.083	-2.454	11.415	0.000	0.571	1,156
CEO_CHAIR	0.143	0.000	0.350	2.040	5.161	0.000	1.000	1,156
CAPX	0.035	0.012	0.057	3.280	18.726	0.000	0.587	1,156
CS	0.124	0.054	0.258	4.773	28.414	0.000	1.771	1156
NDF	0.068	0.022	0.105	2.817	15.331	0.000	0.927	1,156
*INS**	0.809	0.853	0.442	-0.045	2.955	0.000	2.462	1,156
*INSCOV**	0.002	0.000	0.006	0.978	3.229	0.000	0.024	1,156
$INSCOV^2$*	0.000	0.000	0.000	2.492	10.758	0.000	0.001	1,156
INDUS1	0.021	0.000	0.143	6.722	46.188	0.000	1.000	1,156
INDUS2	0.056	0.000	0.230	3.853	15.844	0.000	1.000	1,156
INDUS3	0.024	0.000	0.154	6.190	39.311	0.000	1.000	1,156
INDUS4	0.016	0.000	0.124	7.825	62.238	0.000	1.000	1,156
INDUS5	0.107	0.000	0.310	2.538	7.443	0.000	1.000	1,156
INDUS6	0.003	0.000	0.051	19.553	383.336	0.000	1.000	1,156
INDUS7	0.007	0.000	0.083	11.896	142.507	0.000	1.000	1,156
INDUS8	0.004	0.000	0.066	15.106	229.204	0.000	1.000	1,156
INDUS9	0.001	0.000	0.029	33.956	1154.001	0.000	1.000	1,156
INDUS10	0.231	0.000	0.422	1.277	2.630	0.000	1.000	1,156
INDUS11	0.062	0.000	0.242	3.622	14.122	0.000	1.000	1,156
INDUS12	0.048	0.000	0.213	4.251	19.068	0.000	1.000	1,156
INDUS13	0.170	0.000	0.375	1.761	4.102	0.000	1.000	1,156
INDUS14	0.040	0.000	0.196	4.709	23.172	0.000	1.000	1,156
INDUS15	0.019	0.000	0.137	7.040	50.565	0.000	1.000	1,156
INDUS16	0.024	0.000	0.154	6.190	39.311	0.000	1.000	1,156
INDUS17	0.008	0.000	0.088	11.201	126.452	0.000	1.000	1,156
INDUS18	0.119	0.000	0.323	2.361	6.572	0.000	1.000	1,156

(Source: Research data). This table gives the descriptive statistics for the dependent and independent variables for the unbalanced panel (pooled firm/year) observations of 631 PLCs for 2003-2007 in regression equation 6.1 (n=1,156) and equation 6.2(n=331). ***ERP_CAPM (RAW BETA)*** = Raw beta times market risk premium 7%, where the raw beta is estimated by a market model regression using the previous 60-monthly returns (at least 24 months). ***ERP_CAPM (INDUSTRY-ADJUSTED BETA)*** =

Industry-adjusted beta multiplied by the market risk premium of 7%, where the industry-adjusted beta is the relevered industry median of unlevered raw beta estimated by a market model regression using the returns from previous 60 months (at least 24 months). ***ERP_MEPG*** = Implied cost of equity based on the MPEG model of Easton (2004) minus risk free rate, where risk free rate is defined as yield to maturity of zero coupon one year Chinese Government bond. ***INS*** = A dummy variable equals 1 if a firm has property insurance in the fiscal year; 0 otherwise. ***INSCOV*** = The annual (amortized) corporate spending on property insurance scaled by the prior year-end book value of tangible assets (e.g., fixed assets and inventory***).*** ***INSCOV^2*** = The square of annual corporate spending on property insurance scaled by the prior year-end book value of tangible assets***.*** ***LEV*** = Long term debt to total asset ratio, both measured at the beginning to the fiscal year. ***CASH*** = Cash and cash equivalent scaled by book value of total assets, both measured at the beginning of the fiscal year. ***LnMB*** = Natural logarithm of the ratio of market value of equity to book value of equity. Both are measured at the beginning of the fiscal year. ***LnMV*** = Natural logarithm of the market value of equity, measured at the beginning of the fiscal year. ***UBETA*** = Systematic risk, measured by raw beta estimated from market model regression using the returns from previous 60 months (at least 24 months) divided by one plus the ratio of long-term debt to market value of equity. ***STD_ERR*** = Idiosyncratic risk, defined as the standard deviation of the residual monthly returns in market model regression using the previous 60 months' stock returns (at least 24 months). ***NSHARE*** = the proportion of non-tradable A share***.*** ***FERR*** = Analyst forecast error, defined as (Actual EPS - consensus analyst forecast EPS)/price. ***LnRET12*** = Price run-up, defined as natural logarithm of one plus the compounded stock returns in the previous 12 months. ***STATE_OWN*** = the proportion of stock held by State. ***MAN_OWN*** = The proportion of stocks held by managers. ***BOARDSIZE*** = Number of board members. ***INDBOARD*** = Number of outside directors/board size. ***CEO_CHAIR*** = A dummy variable equals one when the CEO is also the Chairman of a firm, and zero otherwise. ***CAPX*** = Capital expenditure to asset ratio, defined as annual capital expenditure/total assets both at the end of the fiscal year. ***CS*** = Cash flow to sales ratio, defined as (earnings before interest and tax (EBITA) – tax)/sales. ***NDF*** = New debt financing, defined as (total liabilities in year t+1 minus total liabilities in year t)/total assets in year t. ***INS**** = Insurance choice fitted by a random-effects probit model with instrument variables and other control variables. ***INSCOV**** = Insurance coverage use fitted by a random effects tobit model with instrument variable and other control variables. ***INSCOV^2**** = Squared term of *INSCOV**. ***INDUS1-18*** = Industry dummies labeled 1 for the relevant industrial sectors outlined in Appendix A, and 0 otherwise.

Panel B: The Cost of Equity and Insurance Coverage

	Percentiles					
Variables	**10th**	**25th**	**50th**	**75th**	**90th**	**99th**
INSCOV	0.000	0.000	0.001	0.002	0.008	0.050
ERP_CAPM (RAW BETA)	0.055	0.063	0.071	0.079	0.087	0.104
ERP_CAPM (INDUSTRY-ADJUSTED BETA)	0.064	0.067	0.069	0.073	0.078	0.105
ERP_MEPG	0.007	0.014	0.031	0.077	0.140	0.269

(Source: Research data). This table gives equity risk premium (dependent variables, proxy for the cost of equity) used in analysis in different percentiles. ***ERP_CAPM (RAW BETA)*** = Raw beta times market risk premium of 7%, where raw beta is estimated by a market model regression using the previous 60-monthly returns (at least 24 months). ***ERP_CAPM (INDUSTRY-ADJUSTED BETA)*** = Industry-adjusted beta times market risk premium of 7%, where industry-adjusted beta is re-levered industry median of unlevered raw beta estimated by a market model regression using the previous 60 months returns (at least 24 months). ***ERP_MEPG*** = Implied cost of equity based on the MPEG model of Easton (2004) minus risk-free rate, where the risk-free rate is defined as yield to maturity of zero coupon one year Chinese Government bond.

Panel A of Table 7.2 reports the means and medians of the explanatory variables for property insurance user/non-users. It also reports the results of two sample t-tests and

non-parametric Wilcoxon Mann-Whitney (WMW) tests. The former tests differences in the means of the continuous variables between the property insurance users/non-user. And the latter tests differences in the median of continuous variables between the property insurance user/non-user. It can be seen from Table7.2 that both the t-tests and WMW tests are statistically significant for the the cost of equity estimated by the CAPM at conventional levels of confidence. This suggests that the cost of equity for property insurance user is significantly lower than that of non-users by about 10 basis points. This preliminary finding supports hypothesis 1 proposed in Chapter 6. Additionally, statistically significant differences in leverage and growth opportunities are found between property insurance users and non-users. This observation is also consistent with prior studies (Zou and Adams, 2006; Zou, 2010) that property insurance users tend to have higher leverage and growth opportunities compared with non-users. Moreover, the t-tests and WMW statistics both reveal statistically significant differences for *STD_ERR* and *UBETA* between users and non-users of property insurance, indicating that the systematic as well as unsystematic risk of property insurance users are lower than those of non-users by 10 and 46 basis points, respectively. The statistics also indicate that while property insurance users are more likely to have higher concentrations of State ownership (*STATE_OWN*) than non-users, property insurance users tend to have lower levels of insider ownership (*MAN_OWN*) compared with non-users. However, no statistically significant differences in *BOARDSIZE* and *INBOARD* are found between property insurance users and non-users.

Panel B of Table 7.2 reports the results of non-parametric chi-square (χ^2) tests of independence between the property insurance decision and the non-metric variables. The results reveal that there are geographical and industrial differences in the insuring behavior of sample firms. The property risk profile of firms (*HRP_FIRMS*) also appears to influence the corporate insurance decision. While these χ^2 tests are indicative of possible linkages between the property insurance purchase decision and corresponding independent variables, they do not signify the direction of such relations.

Table 7.2: Chinese PLCs, 2003-2007: Comparison of Firm Characteristic between Insurance Users and Nonusers

Panel A: Independent Sample T-test and Wilcoxon-Mann-Whitney Test

variable	Non-users (n =255)			Users (n = 901)			*t* -value	*z*-value for WMW test
	Mean	**Median**	**Std. Dev**	**Mean**	**Median**	**Std. Dev**		
ERP_CAPM	0.072	0.072	0.013	0.071	0.071	0.013	1.337*	1.679*
ERP_CAPM (INDUSTRY-ADJUSTED BETA)	0.071	0.069	0.009	0.070	0.068	0.006	6.125***	2.185**
ERP_MEPG	0.057	0.032	0.075	0.054	0.031	0.057	0.347	0.231
LEV	0.051	0.017	0.085	0.075	0.040	0.094	-3.645***	-4.937***
CASH	0.151	0.115	0.116	0.137	0.116	0.093	1.880**	0.844
LnMB	21.441	21.295	1.048	21.406	21.259	0.962	2.085**	2.396**
LnMV	1.040	0.935	0.760	0.926	0.766	0.781	0.508	0.306
STD_ERR	0.203	0.191	0.068	0.202	0.183	0.101	0.096	1.658*
NSHARE	0.504	0.544	0.185	0.519	0.550	0.166	-1.235	-0.721
UBETA	0.978	0.976	0.274	0.932	0.922	0.274	2.038**	2.215**
FERR	-0.032	0.000	0.189	-0.030	0.000	0.181	-0.160	1.354
LnRET12	0.089	0.014	0.417	0.035	0.000	0.445	1.708**	1.892*
CAPX	0.032	0.007	0.057	0.036	0.057	0.057	-2.815***	-3.238***
NDF	0.061	0.066	0.096	0.070	0.053	0.107	-1.912*	-0.752
CS	0.165	0.019	0.340	0.113	0.023	0.228	2.863*	0.950
STATE_OWN	0.272	0.278	0.240	0.309	0.335	0.229	-2.239**	-2.289**
MAN_OWN	0.006	0.000	0.048	0.001	0.000	0.023	1.981**	1.724*
BOARDSIZE	9.777	9.000	2.077	9.657	9.000	2.080	0.795	-0.218
INDBOARD	0.331	0.333	0.090	0.333	0.333	0.081	-0.319	-0.081

(Source: Research data). This table reports the results of t-tests and non-parametric WMW tests of metric variables distinguished between property insurance user and non-user groups. ***ERP_CAPM (RAW BETA)*** = Raw beta times market risk premium 7%, where raw beta is estimated by a market model regression using the previous 60 months returns (at least 24 months). ***ERP_CAPM (INDUSTRY-ADJUSTED BETA)*** = Industry-adjusted beta times market risk premium of 7%, where industry-adjusted beta is relevered industry median of unlevered raw beta estimated by a market model regression using the previous 60-monthly returns (at least 24 months). ***ERP_MEPG*** = Implied cost of equity based on the MPEG model of Easton (2004) minus risk free rate , where risk free rate is defined as yield to maturity of zero coupon one year Chinese Government bond. ***LEV*** = Long term debt to total asset ratio, both measured at the beginning to the fiscal year. ***CASH*** = Cash and cash equivalent scaled by book value of total assets, both measured at the beginning of the fiscal year. ***LnMB*** = Natural logarithm of the ratio of market value of equity to book value of equity. Both are measured at the beginning of the fiscal year. ***LnMV*** = Natural logarithm of the market value of equity, measured at the beginning of the fiscal year. ***UBETA*** = Systematic risk, measured by raw beta estimated from market model regression using the previous 60 months return (at least 24 month observations) divided by one plus the ratio of long-term debt to market value of equity. ***STD_ERR*** = Idiosyncratic risk, defined as the standard deviation of the residual monthly returns in market model regression using the previous 60 months return (at least 24 months). ***NSHARE*** = the proportion of non-tradable A share**.** ***FERR*** = Analyst forecast error, defined as (Actual EPS - consensus analyst forecast EPS)/price. ***LnRET12*** = Price run-up, defined as natural logarithm of 1 plus the compounded stock returns in the previous 12 months. ***STATE_OWN*** = the proportion of stock held by State. ***MAN_OWN*** = the proportion of stocks held by managers. ***BOARDSIZE*** = Number of board members. ***INDBOARD*** = Number of outside directors/board size. ***CEO_CHAIR*** = A dummy variable equals 1 when the CEO is also the Chairman of a firm, and 0 otherwise. The labels ***, **, and* indicate statistically significant difference from zero at the 0.01, 0.05 and 0.10 levels (two-tailed), respectively.

Panel B: Chi-square Tests of Independence between Non-Metric Variables and Insurance Participation

Variables	χ^2 Stat	d.f.	p-value
CEO_CHAIR	1.373	1	0.241
HPR_FIRM	31.777	1	0.000***
CITYDUM	4.501	1	0.034**
INDUS1	8.144	1	0.004***
INDUS2	3.964	1	0.046**
INDUS3	22.340	1	0.000***
INDUS4	0.302	1	0.583
INDUS5	2.160	1	0.142
INDUS6	0.004	1	0.951
INDUS7	2.324	1	0.127
INDUS8	4.557	1	0.033**
INDUS9	12.304	1	0.000***
INDUS10	1.655	1	0.198
INDUS11	0.139	1	0.709
INDUS12	2.649	1	0.104
INDUS13	24.500	1	0.000***
INDUS14	5.413	1	0.020**
INDUS15	3.849	1	0.050**
INDUS16	1.431	1	0.232
INDUS17	25.655	1	0.000***
INDUS18	39.970	1	0.000***

(Source: Research data). This table reports Chi-square Tests of independence between non-metric variables and insurance purchase choice (insurance participation). ***CEO_CHAIR*** = A dummy variable equals one when the CEO is also the Chairman of a firm, and zero otherwise. ***HPR_FIRM*** = a dummy variable for whether a firm belongs to the manufacturing of chemicals, plastics and rubber, oil and gas extraction/refining, coal mining, and metallurgical engineering industry is denoted as 1, and 0 otherwise. ***CITYDUM*** = a dummy variable for whether a firm locates in east coast and central is denoted as 1, and 0 otherwise. ***INDUS1-18*** = Industry dummies labeled 1 for the relevant industrial sectors outlined in Appendix, and 0 otherwise. The labels ***, **, and* indicate statistically significant difference from zero at the 0.01, 0.05 and 0.10 levels (two-tailed), respectively.

7.3 Bivariate Results

Table 7.3 Panel A presents the correlation coefficients matrix for the dependent variables and explanatory variables used in this study. The Pearson correlation and Spearman rank correlation coefficients reveal statistically significant negative associations between the cost of equity (*ERP_CAPM RAW BETA* and *ERP_CAPM INDUSTRY-ADJUSTED*) and property insurance purchase decision (*INS*). This result suggests that firms purchasing property insurance are likely to have a lower cost of equity compared with those that do not purchase property insurance, thereby tentatively

supporting hypothesis 1. Consistent with expectations, both cost of equity variables estimated by CAPM (raw beta and industry-adjusted beta) are negatively correlated with firm size (*LnMV*) ($p \leq 0.01$, two-tailed), growth opportunity (*LnMB*) ($p \leq 0.01$, two-tailed) and liquidity (*CASH*) ($p \leq 0.05$, two-tailed) implying that Chinese PLCs that are bigger, with more growth opportunities, and higher level of liquidity tend to have lower costs of equity. In line with Modigliani and Miller (1958), *LEV* is also found to be positively associated with *ERP_CAPM* as estimated from market model ($p \leq 0.1$, two-tailed), and industry-adjusted *ERP_CAPM* ($p \leq 0.01$, two-tailed), indicating that highly levered firms are likely to have higher costs of equity. However *LEV* is not significantly correlated with *ERP_MPEG* as estimated by the MPEG model of Easton (2004). Consistent with the CAPM, unlevered beta (*UBETA*) is significant and positively correlated with the cost of equity. As predicted, *NSHARE* is found to be positively associated with the industry-adjusted *ERP_CAPM* ($p \leq 0.01$, two-tailed) and *ERP_MPEG* ($p \leq 0.05$, two-tailed) indicating that firms with more non-tradable shares tend to have higher equity costs. This result appears to support the argument of Zou et al. (2008) that Chinese PLCs with a greater proportion of non-tradable shares in their capital structure are likely to have more acute controlling-minority shareholder incentive conflicts. In turn, this situation results higher costs of equity. The correlation between *ERP_MEPG* and *FERR* is -0.099 which is consistent with prior studies such as Easton and Sommers (2007) suggest that the earnings forecasts tend to be optimistic[41]. A positive correlation between the cost of equity *ERP_CAPM* and insurance coverage *INSCOV* and $INSCOV^2$ is also found. However, correlation measures the strength of linear (Pearson correlation) and monotonic associations (Kennedy, 1998). Moreover, *INSCOV* is also correlated with other determinants of cost of equity (e.g. *LnMB*, *LEV*, and *CASH*). Therefore, the bivariate results might be misleading. Therefore multivariate regression analysis that controls for other determinants of the cost of equity is conducted in the next section of this thesis.

Panel B of Table 7.3 presents the associations between explanatory variables. *UBETA* is negatively correlated with *INS* ($p \leq 0.05$, two-tailed). This finding is consistent with Adams and Hillier (2000) who argue that insurance purchases can reduce firms' systematic risk and thus be reflected in a lower beta. The statistically significant

[41] Note that *FERR* is calculated as actual EPS minus forecasted EPS. Therefore *FERR* represents an inverse proxy of analyst forecast optimism.

correlation between the explanatory variables raises the possibility of multicollinearity. This is particularly the case for *INSCOV* and $INSCOV^2$, which are correlated with each other, and the correlation coefficient between these two variables is 0.83 and significant at the 1% level (two-tailed).

Table 7.3: Chinese PLCs, 2003-2007: Correlation Coefficients

Panel A: Correlation Coefficients Matrix for Dependent Variables and Explanatory Variables

	Pearson Correlation			**Spearman Correlation**		
	ERP_ CAPM (RAW BETA)	***ERP_CAPM (INDUSTRY-ADJUSTED BETA)***	***ERP_ MPEG***	***ERP_ CAPM (RAW BETA)***	***ERP_ CAPM (INDUSTRY-ADJUSTED BETA)***	***ERP_ MPEG***
INS	-0.015**	-0.071***	-0.020	-0.022**	-0.079***	0.046
INSCOV	0.167***	0.189***	0.021	0.088***	0.317***	0.078*
$INSCOV^2$	0.123***	0.123***	0.034	0.088***	0.317***	0.078*
LnMB	-0.099***	-0.285***	-0.120***	-0.143***	-0.365***	0.019
LnMB	-0.191***	-0.207***	-0.121***	-0.221***	-0.228***	-0.106**
LEV	0.002*	0.431***	0.011	0.001*	0.424***	0.030
CASH	-0.084***	-0.167***	0.036	-0.071***	-0.137***	0.003
STD_ERR	0.048*	0.075**	0.148***	0.062**	0.171***	0.188***
NSHARE	0.032	0.079***	0.144***	0.058**	0.188***	0.151***
UBETA	0.910***	0.161***	0.030	0.900***	0.005	0.034
FERR	-0.051*	-0.008	-0.133***	0.026	0.006	-0.099**
LnRET12	-0.061**	-0.223***	-0.016	-0.115***	-0.391***	-0.080*
CAPX	-0.094***	-0.127***	-0.035	-0.080***	-0.155***	-0.075

(Source: Research Data)This table gives pairwise Pearson and Spearman correlation coefficients between dependent and explanatory variables for year 2003-2007. *ERP_CAPM (RAW BETA)* is defined as market premium of 7% multiplied by beta estimated from market model. *ERP_CAPM (INDUSTRY- ADJUSTED BETA)* is defined as market premium of 7% multiplied by industry-adjusted beta. The rest of variables are defined in Appendix A. The labels ***, **, and* indicate significance at 0.01, 0.05 and 0.10 levels (two-tailed), respectively.

Panel B: Correlation Coefficients Matrix for Explanatory Variables

Variable	*INS*	*INSCOV*	*INSCOV²*	*LnMB*	*LnMV*	*LEV*	*CASH*	*STD_ERR*	*NSHARE*	*UBETA*	*FERR*	*LnRET12*
INS		*0.468****	*0.468****	*-0.062**	*0.016*	*0.147****	*0.001*	*-0.072***	*0.048*	*-0.073***	*-0.007*	*-0.042*
INSCOV	0.053		*1.000****	*-0.197****	*-0.172****	*0.135****	*-0.069***	*-0.049*	*0.049*	*0.007*	*0.039*	*-0.207****
INSCOV²	0.024	0.831***		*-0.197****	*-0.173****	*0.135****	*-0.069***	*-0.049*	*0.049*	*0.007*	*0.039*	*-0.207****
LnMB	-0.061**	-0.018	0.022		*0.183****	*-0.044*	*0.030*	*0.128****	*-0.170****	*-0.050*	*-0.050*	*0.117****
LnMV	-0.015	-0.225***	-0.094***	0.117***		*0.046*	*0.0850****	*0.105****	*-0.120****	*-0.134****	*-0.071***	*0.154****
LEV	0.107***	-0.035	-0.037	-0.026	0.074**		*-0.174****	*-0.029*	*0.053*	*-0.202****	*-0.028*	*0.034*
CASH	-0.055*	-0.045	-0.002	-0.012	0.057*	-0.209***		*0.000*	*0.038*	*0.007*	*0.090****	*-0.070***
STD_ERR	-0.003	0.068**	0.047	0.148***	0.068**	-0.038	0.002		*-0.121****	*0.092****	*-0.093****	*0.263****
NSHARE	0.036	0.032	0.013	-0.148***	-0.077***	0.039	0.048	-0.068**		*0.022*	*0.004*	*-0.315****
UBETA	-0.067**	0.063	0.052	-0.038	-0.112***	-0.211***	-0.007	0.065**	-0.002		*0.030*	*-0.044*
FERR	-0.005	0.042	0.014	-0.077***	-0.063**	-0.033	0.056*	-0.046	0.024	-0.040		*-0.131****
LnRET12	-0.050*	-0.204***	-0.103***	0.180***	0.113***	0.065**	-0.047	0.233***	-0.254***	0.019	-0.148***	

(Resource: Research data). Panel B reports pairwise correlation for the years 2003-2007. Pearson correlation coefficients are in the lower triangle (unitalized) and Spearman correlation coefficients are in the upper triangle (italised). Variables are defined in Appendix A. The labels ***, **, and * indicate significance at the 0.01, 0.05 and 0.10 levels (two-tailed), respectively. The industry dummies are omitted for brevity.

However, the variance inflation factors (VIFs) (shown in Appendix B) for *INSCOV* and $INSCOV^2$ are 3.55 and 3.41 respectively which are moderate, and below the low threshold 10 (Kennedy 1998, p. 190). Also, the largest condition indices calculated by finding the square root of the maximum eigenvalue divided by the minimum eigenvalue are around 5.65, which is much less than the suggested threshold 30. (O'Brien, 2006). Therefore, it appears that multiconllinearity is unlikely to be a severe problem in this study. Nevertheless, in the robustness check, the regression analysis is run again using the mean-centered value of *INSCOV* and $INSCOV^2$ so as to further address the concern of multiconllinearity.

7.4 Multivariate Results

Regression models [6.1] and [6.2] are employed to test hypotheses 1 and 2 proposed in Chapter 4 section 4.3. The regression results are analyzed in sections 7.4.1 and 7.4.2 below.

7.4.1 Property Insurance Choice Decision and the Cost of Equity

Table 7.4, Panel A reports the multivariate regression results between the cost of equity (using *ERP_CAPM RAW BETA*) and the property insurance purchase choice *(INS)* based on a standard Ordinary Least Squares (OLS) panel regression. Panel B reports the results from running OLS regression using *ERP_CAPM INDUSTRY-ADJUSTED BETA* as alternative proxy for the dependent variable cost of equity. The Wooldridge test was conducted to check for serial correlation and the resulting F-statistics are 10.23 and 6.38 respectively. Both computed F-statistics reject the null hypothesis of no first-order serial correlation. Peterson (2009) suggests that failing to control for temporal and cross-sectional correlation among sample firms may underestimate the standard errors in a panel data regression. Thus, standard errors are adjusted for clustering at the firm-level to control for within-firm serial correlation and year fixed-effects are included to control for cross-sectional heteroskedasticity. Furthermore, an alternative Newey and West (1987) heteroskedasticity and autocorrelation consistent (HAC) standard errors are employed to control for the serial correlation as well as heteroskedasticity in the panel dataset.

Table 7.4: Chinese PLCs, 2003-2007: Property Insurance Purchase Choice and Cost of Equity (Baseline Regression)

Panel A: Dependent Variable = *ERP_CAPM (RAW BETA)*

	Predicted Signs	Coefficient	Robust Std. Err.	Newey-West Std. Err.	*t*-stat	p-value
intercept	+/-	0.1085***	0.0126	0.0114	10.23	0.00
INS	-	-0.0013**	0.0009	0.0009	-1.79	0.04
LnMV	-	-0.0016***	0.0006	0.0005	-2.99	0.00
LnMB	+/-	-0.0001	0.0010	0.0008	-0.16	0.44
LEV	+	0.0008**	0.0001	0.0001	1.97	0.03
CASH	-	-0.0107**	0.0056	0.0052	-2.08	0.02
NSHARE	+	-0.0013	0.0023	0.0023	-0.59	0.56
YEAR 2004	+/-	0.0029***	0.0009	0.0010	2.93	0.00
YEAR 2005	+/-	0.0042***	0.0013	0.0013	3.17	0.00
YEAR 2006	+/-	-0.0052***	0.0012	0.0013	-4.15	0.00
YEAR 2007	+/-	-0.0023	0.0015	0.0016	-1.45	0.15
INDUS1	+/-	0.0022	0.0028	0.0025	0.87	0.39
INDUS2	+/-	0.0011	0.0028	0.0027	0.40	0.69
INDUS3	+/-	0.0094	0.0063	0.0070	1.35	0.18
INDUS4	+/-	-0.0031	0.0028	0.0025	-1.22	0.22
INDUS5	+/-	0.0128	0.0031	0.0128	1.01	0.32
INDUS6	+/-	-0.0003	0.0036	0.0032	-0.10	0.92
INDUS7	+/-	0.0053	0.0024	0.0037	1.44	0.15
INDUS8	+/-	-0.0040*	0.0026	0.0024	-1.66	0.10
INDUS9	+/-	0.0009	0.0025	0.0023	0.41	0.68
INDUS10	+/-	-0.0006	0.0029	0.0025	-0.25	0.80
INDUS11	+/-	0.0100***	0.0031	0.0030	3.38	0.00
INDUS12	+/-	0.0001	0.0025	0.0022	0.03	0.98
INDUS13	+/-	-0.0049	0.0036	0.0032	-1.52	0.13
INDUS14	+/-	-0.0027	0.0052	0.0042	-0.64	0.52
INDUS15	+/-	0.0086**	0.0041	0.0038	2.25	0.02
INDUS16	+/-	0.0050	0.0069	0.0073	0.68	0.50
INDUS17	+/-	0.0013	0.0027	0.0024	0.56	0.58
No. of Obs	1,156					
Std. Err. adjusted for 395 clusters						
R-square	0.11					
Wooldridge test for autocorrelation F = 10.23 P>F = 0.0000						

(Source: Research data) This table shows the results of regressing risk premium on the property insurance purchase choice. The dependent variable: risk premium is computed as the raw beta times the market risk premium of 7%. The raw beta is estimated from market model (stock return regressing against market return) using the previous 60-monthly returns (at least 24 months). Robust standard errors are adjusted for clustering at the firm level. The *t*-statistics are based on Newey-West errors adjusted for autocorrelation and heteroskedasticity. The labels ***, **, and* indicate significance at the 0.01, 0.05 and 0.10 levels (one-tailed when unidirectional variables have predicted signs and two-tailed otherwise), respectively. Variables are defined in Appendix A.

Panel B: Dependent variable = *ERP_CAPM (INDUSTRY-ADJUSTED BETA)*

	Predicted Signs	Coefficient	Robust Std. Err.	Newey-West Std. Err.	*t*-stat	p-value
intercept	+/-	0.0750***	0.0077	0.0071	10.52	0.00
INS	-	-0.0018**	0.0009	0.0007	-2.14	0.03
LnMV	-	-0.0030**	0.0010	0.0009	-1.79	0.04
LnMB	+/-	-0.0013**	0.0007	0.0006	-2.00	0.02
LEV	+	0.0400***	0.0060	0.0056	7.16	0.00
CASH	-	-0.0065***	0.0022	0.0021	-3.08	0.00
NSHARE	+	-0.0004	0.0012	0.0011	-0.33	0.74
YEAR 2004	+/-	0.0027***	0.0005	0.0005	5.76	0.00
YEAR 2005	+/-	0.0057***	0.0008	0.0009	6.45	0.00
YEAR 2006	+/-	-0.0041***	0.0005	0.0005	-7.95	0.00
YEAR 2007	+/-	-0.0014**	0.0007	0.0007	-2.07	0.04
INDUS1	+/-	-0.0099	0.0104	0.0095	-1.04	0.30
INDUS2	+/-	0.0023**	0.0009	0.0010	2.41	0.02
INDUS3	+/-	-0.0006	0.0004	0.0006	-1.12	0.27
INDUS4	+/-	0.0087	0.0105	0.0096	0.91	0.37
INDUS5	+/-	0.0003	0.0007	0.0007	0.46	0.65
INDUS6	+/-	0.0136	0.0009	0.0111	1.22	0.22
INDUS7	+/-	-0.0016	0.0009	0.0026	-0.63	0.53
INDUS8	+/-	-0.0095***	0.0006	0.0021	-4.62	0.00
INDUS9	+/-	-0.0002	0.0004	0.0004	-0.49	0.63
INDUS10	+/-	-0.0026*	0.0016	0.0014	-1.92	0.06
INDUS11	+/-	-0.0007	0.0009	0.0008	-0.78	0.44
INDUS12	+/-	0.0004	0.0007	0.0007	0.51	0.61
INDUS13	+/-	-0.0006	0.0005	0.0006	-1.04	0.30
INDUS14	+/-	0.0026***	0.0010	0.0009	2.77	0.01
INDUS15	+/-	0.0048*	0.0029	0.0029	1.67	0.10
INDUS16	+/-	-0.0056*	0.0030	0.0030	-1.88	0.06
INDUS17	+/-	0.0014	0.0011	0.0010	1.40	0.16
No. of Obs	1,156					
Std. Err. adjusted for 395 clusters						
R-square	0.44					
Wooldridge test for autocorrelation F = 6.38 P>F = 0.0000						

(Source: Research data) This table shows the results of regressing risk premium on the property insurance purchase choice decision. The dependent variable: risk premium is computed as the industry-adjusted beta times the market risk premium of 7%. The industry-adjusted beta is re-levered industry median of unlevered raw beta estimated by a market model regression using the previous 60- monthly returns (at least 24 months). Robust standard errors are adjusted for clustering at the firm level. The *t*-statitics are based on Newey-West errors adjusted for autocorrelation and heteroskedasticity. The labels ***, **, and* indicate significance at the 0.01, 0.05 and 0.10 levels (one-tailed when unidirectional variables have predicted signs and two-tailed otherwise), respectively. Variables are defined in Appendix A.

After controlling for firm size (*LnMV*), price-to-book (*LnMB*), leverage (*LEV*), liquidity (*CASH*), proportion of non-tradable share (*NSHARE*), and year/industry effects, the property insurance choice decision (*INS*) is significant and negatively related to both the cost of equity variables *ERP_CAPM (RAW BETA)* and *ERP_CAPM (INDUSTRY-ADJUSTED BETA)* at the 5% level (one-tailed). The results are consistent with the univariate and bivariate results, and support hypothesis 1 that firms purchasing property insurance tend to have lower costs of equity. Furthermore, the results are consistent with the agency theory-based argument that property insurance can provide surety to investors by mitigating volatility of future cash flows, agency problems (costs), and bankruptcy/financial distress risks. These attributes result in a lower cost of equity. The coefficient estimate for *INS* is -0.0018 (t=-2.14), while the dependent variable is *ERP_CAPM (INDUSTRY-ADJUSTED BETA)* in the model. This suggests that in economic terms a one standard deviation increase in *INS* (0.415, see Table 7.1 Panel A) is associated with a 7.5 basis point decrease in the cost of equity, which is about 1.1% of the sample mean cost of equity (*ERP_CAPM INDUSTRY-ADJUSTED BETA* 0.071, see Table 7.1 Panel A).

The signs for the control variables accord with those predicted and are consistent with most prior studies. *LnMV* is statistically significant and negatively associated with *ERP_CAPM (RAW BETA)* at the 1% level (one-tailed) and *ERP_CAPM (INDUSTRY-ADJUSTED BETA)* at the 5% level (one-tailed), indicating that relative larger firms are likely to have lower cost of equity. The same result is also reported in Botosan and Plumlee (2005) using US data and Chen, Li and Zou (2012) using Canada data. The coefficient estimates for *LnMB* are negative in both models, but the variable is only significantly related to *ERP__CAPM (INDUSTRY-ADJUSTED BETA)*. *CASH* is found to be negative and statistically significant, using both proxies for the cost of equity, implying that as predicted, firms with lower liquidity risk tend to have lower costs of equity. Moreover, as expected, *LEV* is found to be both positive and statistically significant with *ERP_CAPM (RAW BETA)* and *ERP_CAPM (INDUSTRY-ADJUSTED BETA)*. This finding is consistent with Modigliani and Miller's (1958) view that, all else equal, firms with greater bankruptcy risks are likely to have higher costs of equity.

7.4.2 The Extent of Property Insurance Use and the Cost of Equity

Table 7.5 Panels A and B report the multivariate regression results between the cost of equity (*ERP_CAPM RAW BETA* and *ERP_CAPM INDUSTRY-ADJUSTED BETA*) and the extent of property insurance use *(INSCOV)*. The Wooldridge (2002) test was also conducted to determine the presence of serial correlation. The F-statistics are 27.77 and 13.07 respectively, and reject the null hypothesis of no first-order auto-correlation for the firm/year sample. Thus, as previous standard errors are adjusted for clustering at firm-level and year fixed-effects are included to control for serial correlation and heteroskedasticity (Peterson, 2009). Furthermore, alternative Newey and West (1987) HAC standard errors are employed to further alleviate concerns of over-time and cross-firm correlations.

After controlling for other potential determinants of the cost of equity in the models, the coefficient estimate for *INSCOV* is negative and $INSCOV^2$ is positive. Both are statistically significant at least at the 5% level (one-tailed) where the dependent variables are *ERP_CAPM (RAW BETA*) and *ERP_CAPM (INDUSTRY-ADJUSTED BETA)*. These results are consistent with hypothesis 2, and suggest that there is a U-shape relation between the cost of equity and the extent of property insurance use. The inflection point occurs when *INSCOV* takes approximately 0.037 when *ERP_CAPM (RAW BETA)* is used for the cost of equity proxy and around 0.08 when *ERP_CAPM (INDUSTRY-ADJUSTED BETA)* is employed to estimate the cost of equity. This result supports Zou's (2010) finding that there is an inverted-U shape relation between the extent of insurance use and firm value in the Chinese corporate sector. Given that the inflection point occurs above the 90^{th}-99^{th} percentile of observed insurance spending, property insurance use is likely be beneficial to the majority of firms in the sample of this study. This observation further supports the prediction derived from agency theory that PLCs buying insurance/having higher insurance coverage are likely to be at an economic advantage (i.e., in terms of lower cost of equity and higher firm value) compared with PLCs not buying property insurance/having lower insurance operating in markets such as China, where potential agency conflicts and other inefficiencies (e.g., lack of risk management knowledge and expertise) are likely to be pronounced.

Table 7.5: Chinese PLCs, 2003-2007: The Extent of Property Insurance Use and the Cost of Equity (Baseline Regression)

Panel A: Dependent variable = *ERP_CAPM (RAW BETA)*

	Predicted Signs	Coefficient	Robust Std. Err.	Newey-West Std. Err.	*t*-stat	p-value
intercept	+/-	0.1139***	0.0118	0.0108	10.51	0.00
INSCOV	-	-0.0989**	0.0570	0.0593	-1.67	0.05
$INCOV^2$	+	1.3550***	0.2729	0.2831	4.79	0.00
LnMV	-	-0.0016***	0.0006	0.0005	-3.16	0.00
LnMB	+/-	-0.0000	0.0009	0.0008	-0.03	0.49
LEV	+	0.0108**	0.0055	0.0051	2.10	0.02
CASH	-	-0.0037**	0.0461	0.0042	-1.91	0.03
NSHARE	+	-0.0015	0.0023	0.0023	-0.66	0.51
YEAR 2004	+/-	0.0026***	0.0009	0.0010	2.74	0.01
YEAR 2005	+/-	0.0048***	0.0014	0.0014	3.36	0.00
YEAR 2006	+/-	-0.0052***	0.0012	0.0013	-4.17	0.00
YEAR 2007	+/-	-0.0022	0.0015	0.0015	-1.43	0.15
INDUS1	+/-	-0.0090	0.0061	0.0068	-1.31	0.19
INDUS2	+/-	0.0025	0.0028	0.0025	0.98	0.33
INDUS3	+/-	0.0013	0.0029	0.0027	0.49	0.62
INDUS4	+/-	0.0093	0.0063	0.0071	1.32	0.19
INDUS5	+/-	-0.0030	0.0028	0.0025	-1.20	0.23
INDUS6	+/-	0.0128	0.0031	0.0128	1.00	0.32
INDUS7	+/-	0.0000	0.0034	0.0031	0.01	0.99
INDUS8	+/-	0.0066*	0.0022	0.0036	1.85	0.06
INDUS9	+/-	0.0010	0.0025	0.0023	0.46	0.65
INDUS10	+/-	-0.0003	0.0029	0.0025	-0.13	0.89
INDUS11	+/-	0.0090***	0.0029	0.0028	3.21	0.00
INDUS12	+/-	0.0002	0.0025	0.0022	0.08	0.93
INDUS13	+/-	-0.0049	0.0036	0.0032	-1.52	0.13
INDUS14	+/-	-0.0019	0.0052	0.0042	-0.45	0.65
INDUS15	+/-	-0.0084**	0.0041	0.0038	-2.20	0.03
INDUS16	+/-	0.0055	0.0070	0.0074	0.75	0.46
INDUS17	+/-	0.0016	0.0026	0.0024	0.66	0.51
No. of Obs	1156					
Std. Err. adjusted for 395 clusters						
R-square	0.17					
Wooldridge test for autocorrelation F = 27.77 P>F = 0.0000						
Inflection point ,where, *INSCOV* = 0.037						

(Source: Research Data).This table shows the panel regression results of testing non-linear U-shape relation between the cost of equity and the extent of property insurance use. The dependent variable: risk premium is computed as the raw beta times the market risk premium of 7%. The raw beta is estimated from market model (stock return regressing against market return) using the previous 60 months returns (at least 24 months observations). Robust standard errors are adjusted for clustering at firm level. The *t*-statistics are based on Newey-West errors adjusted for autocorrelation and heteroskedasticity The labels ***, **, and* indicate significance at the 0.01, 0.05 and 0.10 levels (one-tailed when unidirectional variables have predicted signs and two-tailed otherwise), respectively. Variables are defined in Appendix A.

Panel B: Dependent variable = *ERP_CAPM (INDUSTRY- ADJUSTED BETA)*

	Predicted Signs	Coefficient	Robust Std. Err.	Newey-West Std. Err.	*t*-stat	p-value
intercept	+/-	0.0786***	0.0068	0.0068	10.91	0.00
INSCOV	-	-0.0638**	0.0107	0.0120	-1.89	0.02
$INCOV^2$	+	0.3698**	0.1143	0.1284	1.79	0.04
LnMV	-	-0.0003**	0.0002	0.0002	-1.66	0.05
LnMB	+/-	-0.0014**	0.0006	0.0006	-2.42	0.04
LEV	+	0.0072***	0.0019	0.0019	3.85	0.00
CASH	-	-0.0415***	0.0064	0.0059	-7.08	0.00
NSHARE	+	0.0000	0.0012	0.0011	0.04	0.97
YEAR 2004	+/-	0.0026***	0.0005	0.0004	5.83	0.00
YEAR 2005	+/-	0.0053***	0.0008	0.0009	6.22	0.00
YEAR 2006	+/-	-0.0040***	0.0005	0.0005	-8.10	0.00
YEAR 2007	+/-	-0.0013**	0.0006	0.0007	-2.01	0.05
INDUS1	+/-	-0.0101	0.0104	0.0095	-1.06	0.29
INDUS2	+/-	0.0023**	0.0009	0.0010	2.37	0.02
INDUS3	+/-	-0.0007	0.0004	0.0006	-1.33	0.19
INDUS4	+/-	0.0088	0.0104	0.0096	0.92	0.36
INDUS5	+/-	0.0003	0.0007	0.0007	0.48	0.63
INDUS6	+/-	0.0138	0.0009	0.0111	1.24	0.22
INDUS7	+/-	-0.0018	0.0008	0.0026	-0.70	0.49
INDUS8	+/-	0.0090***	0.0007	0.0021	4.35	0.00
INDUS9	+/-	-0.0002	0.0004	0.0004	-0.45	0.65
INDUS10	+/-	-0.0027**	0.0015	0.0014	-2.03	0.04
INDUS11	+/-	-0.0006	0.0009	0.0008	-0.73	0.46
INDUS12	+/-	0.0003	0.0007	0.0007	0.48	0.63
INDUS13	+/-	-0.0006	0.0005	0.0006	-1.05	0.30
INDUS14	+/-	0.0023**	0.0010	0.0010	2.41	0.02
INDUS15	+/-	0.0047	0.0030	0.0029	1.64	0.10
INDUS16	+/-	-0.0058*	0.0029	0.0029	-1.95	0.05
INDUS17	+/-	0.0013	0.0011	0.0010	1.31	0.19
No. of Obs	1156					
Std. Err. adjusted for 395 clusters						
R-square	0.44					
Wooldridge test for autocorrelation F = 13.07 P>F = 0.0000						
Inflection point ,where, *INSCOV* = 0.08						

(Source: Research Data).This table shows the panel regression results of testing nonlinear U-shape relation between the cost of equity and the extent of property insurance use. The dependent variable: risk premium is computed as the industry-adjusted beta times market risk premium of 7%. The industry-adjusted beta is re-levered industry median of unlevered raw beta estimated by a market model regression using the previous 60 months returns (at least 24 months). Robust standard errors are adjusted for clustering at firm level. The *t*-statistics are based on Newey-West errors adjusted for autocorrelation and heteroskedasticity. The labels ***, **, and* indicate significance at the 0.01, 0.05 and 0.10 levels (one-tailed when unidirectional variables have predicted signs and two-tailed otherwise), respectively. Variables are defined in Appendix A.

The signs for the control variables are consistent with the results for the insurance purchase decision and the cost of equity models. *LnMV*, *LnMB* and *CASH* are statistically significant and negatively related to *ERP_CAPM* (*INDUTSTRY-ADJUSTED BETA*) indicating that bigger Chinese PLCs with more growth opportunities and greater amounts of cash are likely to have lower costs of equity. As predicted, the coefficient estimate for *LEV* is statistically significant and positively in both models. However, the estimated coefficients for the idiosyncratic return volatility (*STD_ERR*) and proportion of non-tradable shares (*NSHARE*) are not statistically significant in both models.

7.5 Alternative Estimates of the cost of Equity (*ERP_MPEG*)

Sensitivity tests for the alternative estimates of the costs of equity are also conducted. Tables 7.6 and Table 7.7 report the multivariate results between the cost of equity (*ERP_MPEG*)[42] and property insurance purchase choice decision *(INS)* and the extent of property insurance use (*INSCOV)*. Standard errors are adjusted for clustering at firm-level and year/fixed-effects are included to control for potential common shocks (Peterson, 2009). The Wooldridge (2002) test was also conducted to test the presence of serial correlation. The F-statistics are 10.23 for model [6.5] and 13.07 for model [6.6]. Both tests reject the null hypothesis of no first-order auto-correlation in the sample of Chinese PLCs. Therefore, Newey-West (1987) heteroskedasticity and auto-correlation consistent (HAC) standard errors are also employed to further alleviate concerns of overtime and cross-firm correlation.

As illustrated in Table 7.6, the coefficient estimate for *INS* is statistically significant at the 5% level (one-tailed) and remains negative. This is in line with the result generated from model [6.1]. Amongst the control variables, firm size (*LnMV*) is statistically significant at the 1% (one-tailed) and the sign remains negative. Amongst the control variables, firm size (*LnMV*) is statistically significant at the 1% (one-tailed) and the sign remains negative. As predicted, the systematic risk (*UBETA*) is positively related to the implied cost of equity ($p \leq 0.05$, one-tailed). The rest of the control variables are not statistically significant in this model.

[42] The alternative estimates for the cost of equity are based on Easton (2004)

Table 7.6: Chinese PLCs, 2003-2007: Property Insurance Purchase Choice and the Cost of Equity

Dependent Variable = *ERP_MPEG*

	Predicted Signs	Coefficient	Robust Std. Err.	Newey-West Std. Err.	*t*-stat	p-value
intercept	+/-	-0.1096*	0.0682	0.0654	-1.91	0.06
INS	-	-0.0099**	0.0060	0.0064	-1.68	0.05
LnMV	-	-0.0121***	0.0031	0.0029	-4.11	0.00
LnMB	+/-	0.0053	0.0068	0.0070	-0.76	0.25
LEV	+	0.0113	0.0391	0.0382	0.30	0.38
CASH	-	-0.0044	0.0271	0.0282	-0.16	0.44
UBETA	+	0.0125**	0.0082	0.0081	1.78	0.04
STD_ERR	+	-0.0382	0.0347	0.0360	-1.06	0.15
FERR	-	-0.0676**	0.0340	0.0314	-2.15	0.02
LnRET12	-	-0.0256	0.0344	0.0321	-1.22	0.12
NSHARE	+	-0.0145	0.0174	0.0167	-0.87	0.39
YEAR 2005	+/-	-0.1054***	0.0131	0.0134	-7.85	0.00
YEAR 2006	+/-	-0.0814***	0.0133	0.0139	-5.84	0.00
YEAR 2007	+/-	-0.0940***	0.0128	0.0131	-7.16	0.00
INDUS1	+/-	-0.0242**	0.0113	0.0122	-1.99	0.05
INDUS2	+/-	-0.0179	0.0098	0.0109	-1.64	0.10
INDUS3	+/-	-0.0047	0.0124	0.0130	-0.36	0.72
INDUS4	+/-	0.0148	0.0169	0.0168	0.88	0.38
INDUS5	+/-	0.0008	0.0104	0.0115	0.07	0.94
INDUS6	+/-	-0.0040	0.0141	0.0148	-0.27	0.79
INDUS7	+/-	-0.0287**	0.0140	0.0139	-2.06	0.04
INDUS8	+/-	-0.0176	0.0122	0.0127	-1.39	0.17
INDUS9	+/-	0.0306**	0.0125	0.0126	2.42	0.02
INDUS10	+/-	-0.0174	0.0107	0.0113	-1.55	0.12
INDUS11	+/-	0.0030	0.0139	0.0164	0.19	0.85
INDUS12	+/-	-0.0015	0.0098	0.0109	-0.14	0.89
INDUS13	+/-	-0.0110	0.0103	0.0110	-0.99	0.32
INDUS14	+/-	-0.0289**	0.0121	0.0125	-2.31	0.02
INDUS15	+/-	0.0053	0.0124	0.0128	0.42	0.68
INDUS16	+/-	0.0915***	0.0299	0.0302	3.03	0.00
INDUS17	+/-	0.0091	0.0112	0.0120	0.76	0.45
No. of Obs	331					
Std. Err. adjusted for 196 clusters						
R-square	0.46					
Wooldridge test for autocorrelation F = 10.23 P>F = 0.0000						

(Source: Research Data). This table shows the results of regressing risk premium on property insurance purchase choice. The dependent variable: risk premium is the implied cost of equity based on the MPEG model in Easton (2004) minus the risk-free rate, where the risk-free rate is defined as yield to maturity of zero coupon one year Chinese Government bond. Robust standard errors are adjusted for clustering at the firm level. The *t*-statistics are based on Newey-West errors adjusted for autocorrelation. The labels ***, **, and* indicate significance at the 0.01, 0.05 and 0.10 levels (one-tailed when unidirectional variables have predicted signs and two-tailed otherwise), respectively. Variables are defined in Appendix A.

Table 7.7: Chinese PLCs, 2003-2007: The Extent of Property Insurance Use and the Cost of Equity

Dependent Variable = *ERP_MPEG*

	Predicted Signs	Coefficient	Robust Std. Err.	Newey-West Std. Err.	t-stat	p-value
intercept	+/-	-0.1265*	0.0701	0.0674	-1.88	0.06
INSCOV	-	-0.0305	0.7396	0.7373	-0.04	0.48
$INCOV^2$	+	2.3099	6.1209	6.1030	0.38	0.35
LnMV	-	-0.0125***	0.0032	0.0030	-4.11	0.00
LnMB	+/-	0.0052	0.0071	0.0072	0.72	0.28
LEV	+	0.0060	0.0371	0.0364	0.17	0.43
CASH	-	0.0023	0.0281	0.0287	0.08	0.47
UBETA	+	0.0012	0.0128	0.0137	0.09	0.47
STD_ERR	+	-0.0340	0.0345	0.0363	-0.94	0.18
FERR	-	-0.0689**	0.0254	0.0326	-2.11	0.02
LnRET12	-	-0.0112	0.0134	0.0155	-1.05	0.30
NSHARE	+/-	-0.0170	0.0163	0.0159	-1.07	0.29
YEAR 2005	+/-	-0.1052***	0.0130	0.0133	-7.89	0.00
YEAR 2006	+/-	-0.0806***	0.0146	0.0152	-5.31	0.00
YEAR 2007	+/-	-0.0931***	0.0127	0.0131	-7.13	0.00
INDUS1	+/-	-0.0258**	0.0115	0.0125	-2.07	0.04
INDUS2	+/-	-0.0164	0.0097	0.0109	-1.50	0.13
INDUS3	+/-	-0.0002	0.0136	0.0137	-0.01	0.99
INDUS4	+/-	0.0160	0.0170	0.0170	0.94	0.35
INDUS5	+/-	0.0001	0.0105	0.0117	0.01	0.99
INDUS6	+/-	-0.0063	0.0136	0.0146	-0.43	0.67
INDUS7	+/-	-0.0280**	0.0137	0.0138	-2.03	0.04
INDUS8	+/-	-0.0096	0.0106	0.0113	-0.85	0.39
INDUS9	+/-	0.0299**	0.0125	0.0126	2.37	0.02
INDUS10	+/-	-0.0148	0.0104	0.0110	-1.34	0.18
INDUS11	+/-	0.0016	0.0138	0.0164	0.10	0.92
INDUS12	+/-	-0.0010	0.0098	0.0109	-0.09	0.93
INDUS13	+/-	-0.0109	0.0101	0.0108	-1.00	0.32
INDUS14	+/-	-0.0207**	0.0094	0.0103	-2.01	0.05
INDUS15	+/-	0.0043	0.0124	0.0128	0.33	0.74
INDUS16	+/-	0.0927***	0.0324	0.0327	2.84	0.01
INDUS17	+/-	0.0117	0.0111	0.0119	0.99	0.32
No. of Obs	331					
Std. Err. adjusted for 196 clusters						
R-square	0.46					
Wooldridge test for autocorrelation F = 11.32 P>F = 0.0000						

(Source: Research Data).This table shows the panel regression results of testing nonlinear U-shape relation between the cost of equity and the extent of property insurance use. The dependent variable: risk premium is implied cost of equity based on the MPEG model in Easton (2004) minus the risk-free rate, where the risk-free rate is defined as yield to maturity of zero coupon one year Chinese Government bond. Robust standard errors are standard errors adjusted for clustering at the firm level. The *t*-statistics are based on Newey-West errors adjusted for autocorrelation. The labels ***, **, and* indicate significance at the 0.01, 0.05 and 0.10 levels (one-tailed when unidirectional variables have predicted signs and two-tailed otherwise), respectively. Variables are defined in Appendix A.

For the results of the relation between the extent of insurance use and the cost of equity (model [6.6], shown in Table 7.7), although the signs of *INSCOV* and $INSCOV^2$ remain the same, they are not statistically significant. Among the control variables, only firm size (*LnMV*) is negative and statistically significant ($p \leq 0.001$, one-tailed)[43].

7.6 Robustness Tests

To examine the robustness of the regression results presented in section 7.4, three main diagnostic tests are conducted. First, to investigate the extent to which the results are driven by within-firm and/or cross-firm variations, a firm fixed-effects regression and Fama and MacBeth (1973) regression[44] are employed. Second, to address possible endogeneity with regard to the property insurance decision, a set of corporate governance variables are introduced to the baseline models [6.1] and [6.2]. A two-stage least square (2SLS) regression is then estimated[45]. In the manner described previously in Chapter 6 (section 6.4). Lastly, to further alleviate concerns about potential multicollinearty, model 6.4 is run again using demeaned *INSCOV* and $INSCOV^2$ instead of actual *INSCOV* and $INSCOV^2$ (e.g. see Jaccard et al., 1990). [46]

7.6.1 Within-Firm and Cross-Firm Variations

The fixed-effects regression analysis also helps to address concerns regarding possible omitted time-invariant variable. To the extent that unobservable firm heterogeneity could influence *INS* and *INSCOV*, and is fixed over time, then a fixed-effects regression procedure can effectively eliminate biases due to omitted correlated variables. The results of the fixed-effects regression and the Fama-MacBeth (FM) regression procedure

[43]The lack of statistically significant variables could be the result of insufficient data points since the number of observation drops substantially from 1,156 to 331 in conducting the sensitivitytests.

[44] The Fama-MacBeth (1973) approach essentially comprises two steps. In the first step, for each single time period, a cross-sectional regression is performed. Then, in the second step, final coefficient estimates are obtained as the average of the first step coefficient estimates. It is widely used for the CAPM related panel analysis to control for cross-sectional correlation. In this study, the standard errors of Fama-MacBeth (1973) are Newey-West (1987) HAC standard errors.

[45] While 2SLS is one kind of IV approach it is noted that not all IV approaches are 2SLS.

[46] The results are reported in Appendix C. No significant difference is found compared with the baseline regressions. The range of inflection points is also close to the baseline models.

for the property insurance purchase decision and the cost of equity are reported in Table 7.8 columns (1) to (4). Results for the extent of property insurance use and the cost of equity are reported in Table 7.9 columns (1) to (4). The empirical results are consistent with the baseline regression indicating that the coefficient estimates are not driven by within-firm or cross-firm variations. The coefficient estimates for *INS* are still statistically significant and negative in fixed-effects and FM regression (at least $p \leq 0.05$, one-tailed). Among the control variables, the coefficient estimates for *LnMV* and *CASH* are statistically significant and negative (at least $p \leq 0.05$, one-tailed), while the coefficient estimate for *LEV* is statistically significant and positive (at least $p \leq 0.05$, one-tailed). In addition, *LnMB* is statistically significant and negatively related to *ERP_CAPM (INDUSTRY-ADJUSTED BETA)* in the fixed-effect and FM models (at least $p \leq 0.1$, two-tailed).

The results of the fixed-effects regression and FM regression for the extent of property insurance use and the cost of equity are reported in Table 7.9. (1) to (4). No significant statistical difference is found compared with the results of baseline regression. The estimated coefficient for *INSCOV* remains negative and for $INSCOV^2$ remains positive. Both are statistically significant in both models at the 5% level (one-tailed). These findings again suggest the existence of a U-shape relation between the extent of property insurance use and the cost of equity for those Chinese PLCs in the sample. The inflection points occur in those models when *INSCOV* take in the range from 0.009 to 0.085, which are above 90^{th} percentile of observed insurance spending. Therefore, the empirical findings are consistent with the results obtained from the baseline regression analysis that property insurance use appears beneficial for the majority of the sample firm. Among the control variables, *LnMV*, *LEV*, *CASH* are statistically significant and consistent with theory and the results of prior studies in both models. However, *LnMB* is only statistically significant and negatively related to *ERP_CAPM (INDUSTRY-ADJUSTED BETA)* in the FM model at the 1% level (two-tailed).

Table 7.8: Chinese PLCs (2003-2007): Property Insurance Purchase Decision and the Cost of Equity (Robustness Check)

	Exp. Sign	Firm Fixed Effects		Fama-MacBeth		Control for Corporate Governance	
	+/-	(1)	(2)	(3)	(4)	(5)	(6)
		ERP_CAPM (RAW BETA)	***ERP_CAPM (INDUSTRY-ADJUSTED BETA)***	***ERP_CAPM (RAW BETA)***	***ERP_CAPM (INDUSTRY-ADJUSTED BETA)***	***ERP_CAPM (RAW BETA)***	***ERP_CAPM (INDUSTRY-ADJUSTED BETA)***
INS	-	-0.0018**	-0.0006**	-0.0016**	-0.0003***	-0.0011**	-0.0008**
		(-1.91)	(-1.89)	(-2.78)	(-3.18)	(-1.89)	(-1.97)
LnMV	-	-0.0024**	-0.0036***	-0.0026**	-0.0005**	-0.0022***	-0.0003***
		(-2.14)	(-2.77)	(-2.47)	(-2.39)	(-3.63)	(-2.96)
LnMB	+/-	-0.0011	-0.0002*	-0.0006	-0.0012***	-0.0006	-0.0013*
		(-0.68)	(-1.66)	(-0.51)	(-4.16)	(-0.60)	(-1.93)
LEV	+	0.0064**	0.0253***	0.0010**	0.0442***	0.0008**	0.0396***
		(1.68)	(6.58)	(2.34)	(4.51)	(1.91)	(6.59)
CASH	-	-0.0135**	-0.0009***	-0.0162**	-0.0063***	-0.0104**	-0.0064***
		(-2.18)	(-2.59)	(-2.83)	(-5.60)	(-1.87)	(-2.85)
NSHARE	+	-0.0027	-0.0002	-0.0005	-0.0006	-0.0004	-0.0006
		(-1.29)	(-0.10)	(-1.05)	(-1.34)	(-0.12)	(-0.35)
BOARDSIZE	+/-					-0.0001	-0.0000
						(-0.73)	(-0.07)
INDBOARD	-					-0.0162**	-0.0022**
						(-2.44)	(-2.33)
CEOCHAIR	+/-					0.0001	0.0004
						(0.09)	(0.78)

Table 7.8 Continued

Year Fixed-effects	yes	yes	yes	yes	yes	yes
Industry fixed-effects	no	no	yes	yes	yes	yes
Firm fixed-effects	yes	yes	no	no	no	no
R-Square	0.18	0.41	0.20	0.59	0.16	0.44
No. of Obs.	1,156	1,156	1,156	1,156	1,110	1,110

(Source: Research data). This table presents the result of regressing risk premium on insurance purchase choice by firm fixed effect regression, Fama-MacBeth regression and the result of introducing a set of corporate governance variables. Columns (1), (3) and (5) report result where *ERP_CAPM(RAW BETA)* is used as dependent variable, and computed as raw beta times the market risk premium of 7%, where raw beta is estimated from market model (stock return regressing against market return)using the previous 60 months return (at least 24 months observations). Columns (2), (4) and (6) report result where *ERP_CAPM (INDUSTRY-ADJUSTED BETA)* is used as dependent variable, computed as industry-adjusted beta times the market risk premium of 7%, where industry-adjusted beta is relevered industry median of unlevered raw beta estimated by a market model regression using the previous 60 monthly return (at least 24 month). The *t*-statistics are in parentheses and are based on Newey-West errors for FM regressions, and others are adjusted for clustering at the firm level. The labels ***, **, and * indicate significance at the 0.01, 0.05 and 0.10 levels (one-tailed when unidirectional variables have predicted signs and two-tailed otherwise), respectively. The coefficient estimates for the constant, year and industry indicators are omitted for the sake of brevity. Variables are defined in Appendix A.

Table 7.9: Chinese PLCs (2003-2007): The Extent of Property Insurance Use and the Cost of Equity (Robustness Check)

	Exp. Sign	Firm Fixed Effects		Fama-MacBeth		Control for Corporate Governance	
	(+/-)	(1)	(2)	(3)	(4)	(5)	(6)
		ERP_CAPM (RAW BETA)	***ERP_CAPM (INDUSTRY-ADJUSTED BETA)***	***ERP_CAPM (RAW BETA)***	***ERP_CAPM (INDUSTRY-ADJUSTED BETA)***	***ERP_CAPM (RAW BETA)***	***ERP_CAPM (INDUSTRY-ADJUSTED BETA)***
INSCOV	-	-0.0121**	-0.0658**	-0.0763**	-0.0215**	-0.0446**	-0.0182**
		(-1.91)	(-1.93)	(-2.59)	(-2.42)	(-1.97)	(-1.89)
INSCOV²	+	0.6705**	0.3941**	1.1633**	1.0379**	0.9428***	0.2420**
		(-1.84)	(1.79)	(2.65)	(2.41)	(3.51)	(2.14)
LnMV	-	-0.0026**	-0.0027***	-0.0025**	-0.0004*	-0.0022***	-0.0003**
		(-1.89)	(-2.74)	(-2.57)	(-2.33)	(-3.59)	(-1.78)
LnMB	+/-	0.0012	-0.0004	0.0002	-0.0014***	-0.0006	-0.0012***
		(0.77)	(-1.25)	(0.20)	(-4.64)	(-0.72)	(-2.88)
LEV	+	0.0053**	0.0248***	0.0013*	0.0437***	0.0005**	0.0395***
		(1.95)	(7.38)	(2.38)	(4.61)	(1.88)	(7.49)
CASH	-	-0.0134**	-0.0053**	-0.0150**	-0.0044***	-0.0102**	-0.0050***
		(-2.18)	(-1.92)	(-2.83)	(-5.45)	(-1.81)	(-2.96)
NSHARE	+	-0.0023	0.0001	-0.0003	-0.0004	-0.0002	-0.0001
		(-1.11)	(0.05)	(-0.22)	(-1.21)	(-0.05)	(-0.05)
BOARDSIZE	+/-					-0.0002	-0.0000
						(-1.19)	(-0.12)
INDBOARD	-					-0.0156***	-0.0023**
						(-3.19)	(-2.12)
CEOCHAIR	+/-					-0.0002	-0.0004
						(-0.13)	(-0.88)

Table 7.9 Continued

Year Fixed-effects	yes	yes	yes	yes	yes	yes
Industry fixed-effects	no	no	yes	yes	yes	yes
Firm fixed-effects	yes	yes	no	no	no	no
R-Square	0.17	0.40	0.21	0.59	0.17	0.47
No. of Obs.	1,156	1,156	1,156	1,156	1,110	1,110
Inflection point ,where, *INSCOV* =	0.009	0.085	0.033	0.020	0.024	0.037

(Source: Research data). This table presents the result of testing nonlinear U-shape relation between the cost of equity and the extent of property insurance use by employing Fama-MacBeth regression and the result of introducing a set of corporate governance variables. Columns (1), (3) and (5) report result where *ERP_CAPM(RAW BETA)* is used as dependent variable, and computed as raw beta times the market risk premium of 7%, where raw beta is estimated from market model (stock returns regressing against market returns)using the previous 60 monthly return (at least 24 monthly observations). Columns (2), (4) and (6) report result where *ERP_CAPM (INDUSTRY-ADJUSTED BETA)* is used as dependent variable, computed as the industry-adjusted beta times the market risk premium of 7%. The industry-adjusted beta is re-levered industry median of unlevered raw beta estimated by a market model regression using the previous 60 monthly returns (at least 24 months). The *t*-statistics are in parentheses and are based on Newey-West errors for FM regressions, and others are adjusted for clustering at firm level. The labels ***, **, and* indicate significance at the 0.01, 0.05 and 0.10 levels (one-tailed when unidirectional variables have predicted signs and two-tailed otherwise), respectively. The coefficient estimates for the constant, year and industry indicators are omitted for the sake of brevity. Variables are defined in Appendix A.

7.6.2 Endogeneity: Corporate Governance Variables

The results of entering three more corporate governance variables into the regression analysis are reported in Tables 7.8 and 7.9, columns (5) and (6). Similar results are found as per the baseline regressions. For the property insurance purchase decision and the cost of equity model, the coefficient estimate for *INS* remains statistically significant and negative at the 5% level (one-tailed). The control variables are more 'strongly' significant compared with those in the baseline regression, where *ERP_CAPM (INDUSTRY-ADJUSTED BETA)* is used as the dependent variable as shown in the Table 7.9 column (6). For example, *LnMV* is significant at the 1% level (one-tailed), while it is significant at the 5% level (one-tailed) in the baseline regression. Among the corporate governance variables, the estimated coefficient for board independence (*INDBOARD*) is statistically significant and negative ($p \leq 0.05$, one-tailed) implying that firms with more independent board members are likely to have lower cost of equity, for example, because investors are assured that outside directors help control the effects of a dominant CEO. However, *BOARDSIZE* and *CEO_CHAIR* are not statistically significant at conventional levels of confidence. It is a similar pattern with regard to the extent of property insurance use and the cost of equity model where Tables 7.8 and 7.9, columns (5) and (6) indicate that the size of the board and CEO duality do not have a statistically significant impact on the cost of equity. Moreover, the statistical significance of *INSCOV* and $INSCOV^2$ stay the same, as do the control variables. The inflection points occur in the two models when *INSCOV* equals 0.024 and 0.037, which are above 90^{th} percentile of observed property insurance spending. Again, the results are consistent with those from the baseline regression, which suggests that property insurance use is likely to be beneficial for the majority of sample firms in the dataset. Among the corporate governance variables, the independence of board (*INDBOARD)* is statistically significant at the 1% level (one-tailed) where *ERP_CAPM (RAW BETA)* is used as dependent variable and at the 5% (one-tailed) level where *ERP_CAPM (INDUSTRY-ADJUSTED BETA)* is used as dependent variable in the regression analysis.

7.6.3 Endogeneity: Instrumented Variable Estimation

As discussed in Chapter 6 (section 6.6), endogeneity of the property insurance decision could be a major concern in studies of the economic consequences of insurance decisions and risk management (Zou, 2010). Therefore, to test the robustness of the results from the baseline regression analysis regarding endogeneity, an instrumental variable approach is employed.

7.6.3.1 Property Insurance Purchase Decision and the Cost of Equity

The property insurance purchase decision (*INS)* is instrumented by Equation [6.5] in the first-stage of analysis. It is estimated using a random-effects Probit regression to reflect two dummy values (1/0) of the property insurance choice decision and the panel data nature of cross-section/time-series sample of Chinese PLCs. Before presenting the results, the validity of the three instrumental variables (*HPR_FIRMS, CITYDUM* and *COD*) is tested. First, the Wald test of their joint significance generated a chi-square (χ^2) statistic of 87.23 (*df* = 3), which is statistically significant at the 1% level. Furthermore, the Spearman correlation between *INS* and *INS** (fitted value of insurance choice) is 0.40 (*p*-value = 0.000). These findings support the relevance of these instruments. Second, the Hansen J-statistic for the over-identification test of three instrumental variables is 1.586 (*p*-value = 0.212), which fails to reject the null hypothesis that all instruments are not over-identified. Lastly, Durbin-Wu-Hausman test of endogeneity of *INS* generated a chi-square (χ^2) statistics of 2.572 (*p*-value = 0.121) technically fails to reject the null hypothesis that *INS* is exogenous.

The results reported in Panel A of Table 7.10 demonstrate that the property insurance choice decision is positively related to the high-property-risk firm dummy, geographical location, capital expenditure, asset tangibility ratio and leverage, however negatively related to managerial ownership and size of firm. These results are consistent with prior studies (e.g., Zou and Adams, 2006). The finding that capital expenditure is positively associated with insurance purchase decision provides evidence that the managers of high growth option firms are likely to engage in hedging (insurance) to bond their commitment to shareholders by reducing the volatility of future cash flows arising from

unforeseen perils. In other words, insuring productive assets helps reduce agency costs for shareholders, and other contracting constituents (e.g., debtholders).

Panel B of Table 7.10 reports the results for the second stage regression. The fitted *INS* (*INS**) is found to be statistically significant and negative at the 5% level (one-tailed), which is consistent with the results from baseline regression. Thus, the observation that firms with property insurance tend to have lower costs of equity is robust and does not seem to be severely affected by endogeneity problems.

Table 7.10: Chinese PLCs (2003-2007): Property Insurance Purchase Choice and the Cost of Equity (2SLS IV Approach)

Panel A: First-Stage Regression (Random Effects Probit Model Y = *INS*)

Variables	Exp. Sign	Coefficient
Instrument for *INS*		
HPR_FIRMS	+	1.0612***
		(2.64)
CITYDUM	+	0.6747***
		(2.43)
COD	+	3.3005
		(1.38)
CAPX	+	0.7925**
		(1.78)
MAN_OWN	+/-	-3.4241*
		(-1.72)
STATE_OWN	+/-	0.2037
		(0.85)
ASSTAN	+	0.3169**
		(1.89)
LEV	+	0.2782***
		(3.93)
ASSTAN_LEV	+	0.7094**
		(1.83)
Other predetermined variables from the model 6.1		
LnMV	-	-0.1906***
		(-2.20)
LnMB	+/-	-0.1497*
		(-1.66)
CASH	+/-	-0.1826
		(-0.33)
NSHARE	+/-	0.0299
		(1.00)
Year and other industry dummies		yes

No of Obs.	1,156
log likelihood	-637
Wald χ^2	87.23

(Source: Research data).Panel A presents the first-stage random effects Probit regression of *INS* on the instrument variables (high-property-risk firm dummy, high-property-risk location dummy and interest cost of borrowing) and predetermined control variables included in the second-stage regression of the cost of equity. The *t*-statistics are in parentheses and are based on robust standard error adjusted for clustering at the firm level. The labels ***, **, and* indicate significance at the 0.01, 0.05 and 0.10 levels (one-tailed when unidirectional variables have predicted signs and two-tailed otherwise), respectively. The coefficient estimates for the constant, year and industry indicators are omitted for the sake of brevity. Variables are defined in Appendix A.

Panel B: Second-Stage Regression of the Cost of Equity on the Fitted Property Insurance Purchase Choice

	Exp. Sign	***ERP_CAPM (RAW BETA)***	***ERP_CAPM (INDUSTRY-ADJUSTED BETA)***
*INS**	-	-0.0005**	-0.0007**
		(-1.76)	(-1.88)
LnMV	-	-0.0022***	-0.0004**
		(-3.52)	(-1.93)
LnMB	+/-	-0.0005	-0.0011**
		(-0.57)	(-2.22)
LEV	+	0.0020**	0.0378***
		(1.91)	(6.04)
CASH	-	-0.0108**	-0.0052***
		(-1.95)	(-3.15)
NSHARE	+	-0.0013	-0.0006
		(-0.6)	(-0.76)
Year Fixed-effects		yes	Yes
Industry fixed-effects		yes	Yes
No. of Obs.		1,156	1,156
R-square		0.16	0.47

(Source: Research data).Panel B presents results from the second-stage regression of the cost of equity on the fitted extent of insurance use (*INS**). *INS** is fitted by a first-stage random effects Probit regression of *INSCOV* on the instrument variables (high-property-risk firm dummy, high-property-risk location dummy and interest cost of borrowing) and control variables for *INS*, and the predetermined control variables included in the second-stage regression of cost of equity. The *t*-statistics are in parentheses and are based on robust standard error adjusted for clustering at the firm level. The labels ***, **, and* indicate significance at the 0.01, 0.05 and 0.10 levels (one-tailed when unidirectional variables have predicted signs and two-tailed otherwise), respectively. The coefficient estimates for the constant, year and industry indicators are omitted for the sake of brevity. Variables are defined in Appendix A.

7.6.3.2 The Extent of Property Insurance Use and the Cost of Equity

Similar to the instrument of *INS* reported above in section 7.6.3.1, the extent of property insurance use (*INSCOV)* is instrumented by Equation [6.6] in the first-stage analysis. However, now *INSCOV* is estimated using a random effects Tobit regression to reflect the existence of zero insurance observations and the panel data nature of the cross-section/time-series sample of Chinese PLCs. The Spearman correlation between *INSCOV* and *INSCOV** (fitted value of *INSCOV*) is 0.45, which is statistically significant at the 1% level and thereby supports the relevance of the instrument. The Durbin-Wu-Hausman test of endogeneity of *INSCOV* generated a chi-square (χ^2) statistics of 2.612 (*p*-value = 0.110), which technically fails to reject the null hypothesis that *INSCOV* is exogenous.

Panel A of Table 7.11 presents the results form Tobit regression for the first stage. The extent of property insurance use is positively related to the instrumental variable *INSCOV_INDUS_MEDIAN*, capital expenditure, asset tangibility ratio, leverage, and proportion of shares held by the State. However, the extent of property insurance purchased is negatively related to firm size. Except for the asset tangibility ratio, the other results are consistent with prior studies (e.g. Zou and Adams, 2006; Zou and Adams, 2008a; Zou, 2010). The finding of a positive relation between *STATE_OWN* and *INSCOV* is also consistent with Jia et.al's (2011) study that finds that Chinese firms with more State-owned shareholdings are expected to purchase more property insurance than firms with less State-owned shares-for example, because property insurance coverage could relieve the government from making large payments in the event of unexpectedly severe asset losses. The positive coefficient estimate for the asset tangibility ratio shows that not surprisingly, Chinese PLCs with more tangible assets are likely to purchase more property insurance. Nevertheless, it is worth noting that the instrumental variable *INSCOV_INDUS_MEDIAN* is statistically significant at the 1% level (one-tailed) supporting the use of instrumental vairables in the analysis.

Panel B of Table 7.11 shows the results for the second-stage regression. The fitted variables *INSCOV* and $INSCOV^2$ (*INSCOV**, $INSCOV^2$*) are found to be statistically significant (at least at $p \leq 0.05$, one-tailed). The coefficient estimate for *INSCOV** remains positive and the coefficient for $INSCOV^2$* remains negative again indicating

the non-linear U-shape relation between the extent of property insurance use and the cost of equity, - a result that is consistent with that of baseline regressions. The results of these control variables are similar to those for the baseline regressions as well[47]. The inflection point occurs when *INSCOV* equals to 0.0378, above the 90th percentile of observed insurance spending. Therefore, the result that Chinese PLCs that purchase higher levels of property insurance are likely to have lower costs of equity is robust and does not seem to be severely affected by endogeneity problems.

Table 7.11: Chinese PLCs (2003-2007): The Extent of Property Insurance Use and the Cost of Equity (2SLS IV Approach)

Panel A: First-Stage Regression (Random Effects Tobit Model, Y = *INSCOV*)

Variables	Exp. Sign	Coefficient
Instrument for *INSCOV*		
INSCOV_INDUS_MEDIAN	+	0.1221***
		(2.14)
Control variables for *INSCOV*		
CAPX	+	0.0062**
		(1.74)
MAN_OWN	+/-	-0.0109
		(-0.86)
STATE_OWN	+/-	0.0011*
		(1.88)
ASSTAN	+	0.0035***
		(2.33)
LEV	+	0.0004
		(1.21)
ASSTAN_LEV	+	0.0070*
		(1.54)
Other predetermined variables from the model 6.2		
LnMV	-	-0.0023***
		(-5.64)
LnMB	+/-	-0.0030***
		(-5.94)
CASH	+/-	-0.0033
		(-1.12)
NSHARE	+	-0.0025
		(-1.44)
Year and industry dummies		Yes
No. of Obs. (No. of left-censored obs.)		1,156 (255)
log likelihood		3,483.19
Wald χ^2		448.74

[47] The identification of the U-shaped relation between property insurance and the equity cost of capital emphasizes the importance of controls for endogeneity of the property insurance decision.

(Source: Research data).Panel A presents the first-stage random-effects Trobit regression of *INSCOV* on the instrument variable (industry median of *INSCOV* in the same city excluding the firm in question in the same year) and control variables for *INSCOV*, and predetermined control variables included in the second-stage regression of the cost of equity. *t*-statistics are in parentheses and are based on robust standard error adjusted for clustering at the firm level. The labels ***, **, and* indicate significance at the 0.01, 0.05 and 0.10 levels (one-tailed when unidirectional variables have predicted signs and two-tailed otherwise), respectively. The coefficient estimates for the constant, year and industry indicators are omitted for the sake of brevity. Variable definitions are in Appendix A.

Panel B: Second-Stage Regression of the Cost of Equity on the Fitted Extend of Property Insurance Use

	Exp. Sign	***ERP_CAPM (RAW BETA)***	***ERP_CAPM (INDUSTRY ADJUSTED BETA)***
*INSCOV**	-	-0.0885**	-0.0309***
		(-1.89)	(-2.49)
$INSCOV^2$*	+	1.2023***	1.6629**
		(2.43)	(1.90)
LnMV	-	-0.0020**	-0.0010*
		(-2.21)	(-1.71)
LnMB	+/-	-0.0002	-0.0002*
		(-1.11)	(-1.79)
LEV	+	0.0092*	0.0404***
		(1.68)	(7.48)
CASH	-	-0.0099**	-0.0067***
		(-2.33)	(-3.19)
NSHARE	+	-0.0015	-0.0004
		(-0.60)	(-0.33)
Year Fixed-effects		yes	yes
Industry fixed-effects		yes	yes
R-Square		0.15	0.46
No of Obs.		1,156	1,156
Inflection point ,where, *INSCOV* =		0.038	0.009

(Source: Research data).Panel B presents results from the second-stage regression of the cost of equity on the fitted extent of insurance use (*INSCOV**) and its square term ($INSCOV^2$*). *INSCOV** is fitted by a first-stage random-effects Tobit regression of *INSCOV* on the instrument variable (industry median of *INSCOV*) and control variables for *INSCOV*, and the predetermined control variables included in the second-stage regression of cost of equity. The *t*-statistics are in parentheses and are based on robust standard error adjusted for clustering at the firm level. The labels ***, **, and* indicate significance at the 0.01, 0.05 and 0.10 levesl (one-tailed when unidirectional variables have predicted signs and two-tailed otherwise), respectively. The coefficients of the constant, year and industry indicators are omitted for brevity. Variable are defined in Appendix A.

7.7 Results of Insurance Use, Sub-Optimal Investment and the Cost of Equity (Hypothesis 3)

As noted earlier, the results of relation between property insurance use and the cost of equity are unlikely to be driven by the endogeneity problem of the insurance decision. Therefore, the analysis in this section is based on the original *INSCOV*. Panel A of the Table 7.12 reports the results of the first step regression between *CAPX* (capital expenditure-to-total assets) and *INSCOV* based on the panel OLS regression. Panel B and C of Table 7.12 present the results of the second step regression adding *CAPX* in model [6.2] where the dependent variables are *ERP_CAPM(RAW BETA)* and *ERP_CAPM (INDUSTRY-ADJUSTED BETA)*, respectively. As previously, standard errors are adjusted for clustering at the firm-level and year, industry fixed effect are included to control for potential serial correlation and heteroskedasticity (e.g., see Peterson, 2009).

After controlling for the effect of other factors on *CAPX*, the sign of the estimated coefficient for *INSCOV* is statistically positive at the 1% level (one-tailed) in the first-step regression, suggesting that firms with higher levels of property insurance are likely to spend more on prospective projects and less prone to the effects of investment crowding-out and/or managerial risk aversion problems. This finding is in line with what was previously predicted in Hypothesis 3 (see Chapter 4, section 4.3.2). The control variables are also consistent with prior predictions and previous reserch (e.g., Zou, 2010). In the second-step regression, *CAPX* is significantly positively related to both *ERP_CAPM*, while the signs for *INSCOV* and $INSCOV^2$ remain the same as in earlier tests. Moreover, the inflection points are again within the similar range as in previous tests (see section 7.4.2). This observation further indicates that the effects of investment crowding-out and/or managerial risk aversion are priced by investors in the cost of equity. In other words, firms are rewarded by the reduction of the cost of equity if those agency problems are not severe. Putting the results of the two-steps of analysis together, the findings are thus consistent with Hypothesis 3 that firms with property insurance or more property insurance are likely to spend more on prospective investment projects. Furthermore, such firms with property insurance appear to suffer less from investment crowding-out and/or managerial risk aversion problems, and tend to have lower costs of equity compared with those firms that do not insure their

productive assets. This is believed to be the first empirical evidence of its kind supporting the view that property insurance helps to reduce firms' costs of equity by mitigating agency problems. This observation also complements the findings of Zou (2010) that property insurance can actively increase the value of firms by facilitating new positive NPV investment projects.

Table 7.12: Chinese PLCs (2003-2007): Property Insurance Use, Sub-Optimal Investment and the Cost of Equity

Panel A Property Insurance, Sub-Optimal Investment (Dependent Variable = *CAPX*)

Variable	Exp. Sign	Coefficient	Std. Err	*t*-stat	p-value
intercept	+/-	0.0366***	0.0054	6.82	0.00
INSCOV	+	0.0734**	0.0366	2.00	0.05
NDF	+	0.0641***	0.0134	4.77	0.00
CS	+	0.0031	0.0000	0.08	0.93
LnMB	-	-0.0028*	0.0009	-1.91	0.06
YEAR 2004	+/-	-0.0026	0.0038	-0.69	0.49
YEAR 2005	+/-	-0.0059	0.0048	-1.22	0.22
YEAR 2006	+/-	-0.0045	0.0047	-0.96	0.34
YEAR 2007	+/-	-0.0040	0.0051	-0.79	0.43
INDUS1	+/-	0.0082	0.0171	0.48	0.63
INDUS2	+/-	0.0064	0.0063	1.02	0.31
INDUS3	+/-	0.0195*	0.0109	1.78	0.08
INDUS4	+/-	0.0134	0.0201	0.67	0.51
INDUS5	+/-	0.0240***	0.0081	2.96	0.00
INDUS6	+/-	0.0362***	0.0036	9.97	0.00
INDUS7	+/-	-0.0031	0.0085	-0.36	0.72
INDUS8	+/-	-0.0105***	0.0033	-3.15	0.00
INDUS9	+/-	-0.0185***	0.0050	-3.73	0.00
INDUS10	+/-	0.0104**	0.0047	2.19	0.03
INDUS11	+/-	0.0170*	0.0088	1.94	0.05
INDUS12	+/-	0.0123*	0.0066	1.85	0.07
INDUS13	+/-	0.0333***	0.0068	4.91	0.00
INDUS14	+/-	0.0154*	0.0080	1.92	0.06
INDUS15	+/-	0.0158	0.0214	0.74	0.46
INDUS16	+/-	0.0480***	0.0181	2.66	0.01
INDUS17	+/-	0.0168*	0.0095	1.77	0.08
R-square		0.10			
Std. Err. adjusted for 395 clusters					
No of Obs		1,156			

(Source: Research Data). Panel A presents the first-step OLS regression of *INSCOV* on *CAPX*. The *t*-statistics are based on robust standard error adjusted for clustering at the firm level. The labels ***, **, and* indicate significance at the 0.01, 0.05 and 0.10 levels (one-tailed when unidirectional variables have

predicted signs and two-tailed otherwise), respectively. Variables are defined in Appendix A. CS is winzorised at the top and bottom of 1 percentile to reduce the effect of outliers.

Panel B Dependent Variable = *ERP_CAPM (RAW BETA)*

	Exp. Sign	Coefficient	Std. Err.	*t-stat*	p-value
intercept		0.1181***	0.0126	9.37	0.00
INSCOV	-	-0.0667**	0.0461	-1.97	0.05
$INSCOV^2$	+	1.0350***	0.2668	3.88	0.00
CAPX	-	-0.0142*	0.0074	-1.81	0.07
LnMV	+/-	-0.0021***	0.0006	-3.60	0.00
lnMB	-	-0.0002	0.0008	-0.95	0.78
LEV	+	0.0022*	0.0049	1.89	0.06
CASH	-	-0.0106*	0.0055	-1.94	0.05
NSHARE	+	-0.0016	0.0023	-0.70	0.49
YEAR2004	+/-	0.0022***	0.0008	2.70	0.01
YEAR2005	+/-	0.0045***	0.0013	3.48	0.00
YEAR2006	+/-	-0.0050***	0.0011	-4.63	0.00
YEAR2007	+/-	-0.0014	0.0014	-0.98	0.33
INDUS1	+/-	-0.0021	0.0039	-0.55	0.58
INDUS2	+/-	0.0025	0.0028	0.88	0.38
INDUS3	+/-	0.0016	0.0029	0.55	0.58
INDUS4	+/-	-0.0028	0.0028	-0.99	0.32
INDUS5	+/-	0.0141***	0.0022	6.35	0.00
INDUS6	+/-	-0.0003	0.0035	-0.10	0.92
INDUS7	+/-	0.0064***	0.0023	2.75	0.01
INDUS8	+/-	-0.0047*	0.0026	-1.80	0.07
INDUS9	+/-	0.0011	0.0025	0.42	0.68
INDUS10	+/-	-0.0006	0.0029	-0.19	0.85
INDUS11	+/-	0.0091***	0.0029	3.09	0.00
INDUS12	+/-	0.0004	0.0026	0.16	0.87
INDUS13	+/-	-0.0049	0.0037	-1.34	0.18
INDUS14	+/-	-0.0021	0.0052	-0.40	0.69
INDUS15	+/-	-0.0075*	0.0040	-1.89	0.06
INDUS16	+/-	0.0060	0.0071	0.84	0.40
INDUS17	+/-	0.0017	0.0026	0.66	0.51
R-square		0.17			
Std. Err. adjusted for 395 clusters					
No of Obs		1,156			
Inflection point ,where, *INSCOV*= 0.032					

(Source: Research Data). Panel B presents the second step OLS regression of *CAPX* on *ERP_CAPM (RAW BETA)*. The *t*-statistics are based on robust standard error adjusted for clustering at the firm level. The labels ***, **, and* indicate significance at the 0.01, 0.05 and 0.10 levels (one-tailed when unidirectional variables have predicted signs and two-tailed otherwise), respectively. Variables are defined in Appendix A.

Panel C Dependent Variable = *ERP_CAPM (INDUSTRY-ADJUSTED BETA)*

Variable	Exp. Sign	Coefficient	Std. Err.	*t-stat*	p-value
intercept		0.1166***	0.0126	9.29	0.00
INSCOV	-	-0.0179**	0.0059	-2.14	0.03
$INSCOV^2$	+	0.9392***	0.0165	3.95	0.00
CAPX	-	-0.0134*	0.0075	-1.92	0.06
LnMV	-	-0.0020***	0.0006	-3.48	0.00
lnMB	-	-0.0003*	0.0001	-1.88	0.06
LEV	+	0.0020**	0.0010	2.33	0.02
CASH	-	-0.0102*	0.0055	-1.86	0.06
NSHARE	+	-0.0018	0.0023	-0.80	0.43
YEAR2004	+/-	0.0022***	0.0008	2.58	0.01
YEAR2005	+/-	0.0044***	0.0013	3.44	0.00
YEAR2006	+/-	-0.0051***	0.0011	-4.69	0.00
YEAR2007	+/-	-0.0018	0.0014	-1.23	0.22
INDUS1	+/-	-0.0097	0.0059	-1.63	0.10
INDUS2	+/-	0.0023	0.0028	0.82	0.41
INDUS3	+/-	0.0016	0.0028	0.57	0.57
INDUS4	+/-	0.0101*	0.0060	1.68	0.09
INDUS5	+/-	-0.0029	0.0028	-1.01	0.31
INDUS6	+/-	0.0144***	0.0022	6.47	0.00
INDUS7	+/-	-0.0001	0.0036	-0.03	0.98
INDUS8	+/-	0.0062***	0.0023	2.68	0.01
INDUS9	+/-	-0.0049*	0.0026	-1.87	0.06
INDUS10	+/-	0.0011	0.0025	0.44	0.66
INDUS11	+/-	-0.0004	0.0029	-0.14	0.89
INDUS12	+/-	0.0090***	0.0029	3.09	0.00
INDUS13	+/-	0.0005	0.0026	0.20	0.84
INDUS14	+/-	-0.0048	0.0037	-1.32	0.19
INDUS15	+/-	-0.0022	0.0052	-0.42	0.68
INDUS16	+/-	-0.0075*	0.0040	-1.87	0.06
INDUS17	+/-	0.0063	0.0072	0.88	0.38
R-square		0.47			
Std. Err. adjusted for 395 clusters					
No of Obs		1,156			
Inflection point ,where, *INSCOV* = 0.010					

(Source: Research Data). Panel B presents the second-step OLS regression of *CAPX* on *ERP_CAPM (INDUSTRY ADJUSTED BETA)*. The *t*-statistics are based on robust standard error adjusted for clustering at the firm level. The labels ***, **, and * indicate significance at the 0.01, 0.05 and 0.10 levels (one-tailed when unidirectional variables have predicted signs and two-tailed otherwise), respectively. Variables are defined in Appendix A.

7.8 Summary and Conclusions

This chapter presents the empirical results obtained from a suite of multivariate statistical tests conducted on an unbalanced panel dataset of 631 Chinese PLCs for the period 2003-2007. The two primarily hypotheses put forward in Chapter 4 (section 4.3) are tested by regressing costs of equity, estimated using the CAPM and the MPEG model against the property insurance purchase choice decision and the extent of property insurance use, respectively. Consistent with what was hypothesized, firms purchasing property insurance are found to have lower costs of equity. This finding supports the agency theory-based argument that insurance can decrease costs of equity by mitigating agency problems (costs). In line with recent prior research (Zou, 2010), a non-linear U-shape relation between the extent of property insurance use and the cost of equity is also found in the Chinese corporate sector. Given that the inflection occurs above the 90th percentile of observed property insurance spending, property insurance use is likely to be beneficial to the majority of sample firms in this study. Furthermore, consistent with the predictions of agency theory (Subsidiary Hypothesis 3) shareholders appear to reduce share prices (i.e., require lower returns) when a firm insures its assets in order to mitigate agency incentive conflicts such as the investment crowding-out and/or managerial risk aversion problems. Additionally, consistent with theory and previous published research, costs of equity are found to be negatively related to firm size, price-to-book ratio and firm's liquidity, but positively related to leverage. Finally, no statistically significant empirical evidence is found to suggest that agency incentive conflicts between controlling and minority shareholder increases costs of equity in China. The main conclusions, implications deriving from the results of this study, some inherent limitations with the research design, and prospects for future research are now considered in the next and final chapter of this thesis.

CHAPTER 8. SUMMARY AND CONCLUSIONS

8.1 Introduction

This final chapter of the thesis summarizes the research results and presents the main conclusions and implications arising from the study. Additionally, the contribution of the research is evaluated and the limitations of the study are highlighted. Prospective areas for further research are also considered in this chapter.

8.2 Overview of the Project

There are two generally held views on corporate risk management (insurance) in the academic literature. One views corporate risk management (insurance) as a mean of ensuring loss avoidance with little consideration of its importance in the corporate strategic investment and risk-taking decisions. The other sees corporate risk management (insurance) as an integral part of the value creation process. That is, one in which the concept of economic capital, when applied with prudence and judgement, provides companies with a financial cushion and the confidence to carry out their strategic plans (Doherty, 2005). A large number of studies have focused on the determinants of corporate hedging. (e.g Smith and Stulz,1985; Stulz, 1996, Leland, 1998; Bessembinder, 1991; Froot et al., 1993; Zou and Adams, 2006). Some prior research has focused on the relation between hedging and firm value (see e.g Allayannis and Weston, 2001; Granham and Rogers, 2002; and Zou, 2010). In contrast, previous studies that explore how hedging impacts on the cost of equity are few and only use financial derivatives data. For example Gay et al. (2011) examine how derivatives use affects the cost of equity for US listed company for 1992-1996 and 2004-2006. They find that firms using derivatives tend to have lower costs of equity than firms that do not hedge. This research study thus fills a void of the literature by examining the impact of property insurance use on the cost of equity for Chinese PLCs. Specifically, the study addresses two main research questions:

- *Does property insurance influence a firm's cost of equity capital?*
- *If it does, to what extent does property insurance impact on a firm's cost of equity capital?*

The Chinese market is a potentially powerful setting for examining the relation between property insurance and the cost of equity for four main reasons. First, China has become one of the biggest recipients of FDI in the world since the WTO Agreement of 2004. Moreover, there are now increasing numbers of Chinese companies seeking overseas listing status. Those attributes have offered international investors increased prospects for risk diversification (Zou and Adams, 2006).

Second, property insurance is the predominant risk management technique used in China's corporate sector as the market for alternative hedging techniques in China are generally undeveloped (Zou, 2010). Therefore, this attribute enables this study to avoid potentially confounding effets of (unobserved) hedging substitutes (e.g. derivatives use).

Third, China has its unique ownership structure which could exacerbate agency incentive conflicts in firms. A large number of listed companies in China are State-controlled. About two-thirds of total corporate shares are either held by government agencies (i.e. the State shares), or held by State-related legal entities (usually SOEs) such as the legal-person shares (Zou and Adams, 2008b). Both State shares and legal-person shares are not publicly tradable, which gives rise to different voting rights between tradable shares and non-tradable shares. Those attributes provide a potentially powerful setting for testing agency theory-based argument of the relation between property insurance and the cost of equity.

Fourth, Lee and Rui (2000) observe that a key inhibitor to the efficient operation of financial markets in China is the lack of knowledge held by investors (particularly those from overseas) as to the future growth opportunities of companies with different ownership and control structures (e.g., State versus private shareholdings). This information asymmetry problem is compounded by a relatively undeveloped market for credit ratings in the Chinese corporate sector compared with Western countries (Ferri et al., 2001) (see also Chapter 1, section 1.4, footnote 10). Therefore, this study provides insights as to whether investors in China price securities differently for firms purchasing property insurance compared with firms that do not insure or do not insure to any significant degree. Moreover, the research project could be of potential relevance to managers, policymakers, investors, and others with an economic interest in China. For

example, by enabling the managers of PLCs to better understand the effects of insurance purchases on business operations and firm value. This could also help them improve their risk management practices in the future. The key features of the China's financial and insurance market were discussed in detail in Chapter 2.

In Chapter 3 of this thesis, the study critically reviewed the positive-descriptive-type theories reported in the financial economics literature that could be adopted to address the research question of this study. From the literature review, agency theory was identified as the most appropriate and viable framework to guide empirical testing. Specifically, severn agency problems that could impact on the cost of equity are identified. (See Table 3.2) Drawing a framework from agency theory, this study then puts forward two main hypotheses and one subsidiary hypothesis in Chapter 4 regarding the linkage between property insurance use and the cost of equity. Chapter 5 evaluates the cost of equity models used in prior studies and identifies the CAPM and MPEG model (Easton, 2004) as the two cost of equity models that best fit the current dataset of Chinese PLCs.

Statistical analysis for panel data is employed to test empirically the three main hypotheses derived from agency theory in this study. Statistical tests are considered to have the advantages of being scientifically rigorous and generalizable. The research design is described in Chapter 6. The results derived from the statistical testing of panel data for 631 Chinese PLCs over the five years 2003-2007 are reported in Chapter 7 of this thesis. Overall, the analysis of the empirical evidence reported in this thesis suggests that agency theory is an intuitively useful framework for explaining the relation between property insurance use and the cost of equity in the Chinese corporate sector. Section 8.3 below now presents the main conclusions and implications derived from the data analysis performed during the course of this study.

8.3 Research Conclusions and Implications

Four main conclusions arise from the analysis of the empirical results obtained in this study. These conclusions and their implications are as follows.

First, agency theory-based arguments appear to be appropriate to explain the relation between property insurance use and the cost of equity. Specifically, this study finds that consistent with what was hypothesized, firms purchasing property insurance are likely to have a lower cost of equity than those firms not purchasing property insurance. This could reflect that property insurance acts as an effective control that helps re-aligns the interests of manager and shareholders. As a result, when property insurance enables managers to maximize shareholder's wealth by investing in positive NPV projects, shareholders are likely to seek less price-protection (require lower returns), thus reducing the firm's cost of equity.

Second, the study finds that there is a non-linear U-shape relation between the extent of property insurance use and the cost of equity for Chinese PLCs. This result accords with the findings of Zou (2010) that the relation between the extent of property insurance use and the firm value is an inverted U-shape. Given the inflection point occurs above the 90^{th} percentile of the sample of firms, property insurance use appears to be beneficial to most Chinese PLCs. In other words, this observation suggests that firms with higher levels of property insurance tend to have lower costs of equity compared with those firms with lower levels of property insurance. On one hand, property insurance could thus encourage investors to increase their equity stakes in well-hedged (insured) firms so that they fully realize their potential economic value. On the other hand, ex-post financing mechanisms, like property insurance, could help firms to release their holdings of equity capital. This indicates that property insurance might be able to help firms optimize their capital structure. Again, this implication is consistent with the predictions of the agency theory.

Third, to further examine the relation between the extent of property use and cost of equity, the study tested whether insurance can reduce the cost of equity by mitigating agency incentive conflicts such as the investment crowding-out and/or managerial risk aversion problems. As predicted, the empirical results indicate that firms where these two agency problems are mitigated by property insurance are likely to reduce their costs of equity. Firms purchasing property insurance (lowering agency costs) are able to take on new value-added projects for which the NPV exceeds the transaction costs of insuring. This is particularly important in China, where external funding opportunities could be obfuscated by severe information asymmetry problems. The positive linkage

between a firm's growth options and the purchase property insurance could also reflect the intention of managers and/or shareholders to actively manage business risks and mitigate agency problems in companies with high growth options. This finding further supports the propositions of agency theory.

Fourth, consistent with prior studies and finance theory, control variables, such as firm size and the price-to-book ratio are negatively related to the cost of equity. This suggests that large firms tend to be less inherently risky than small firms (e.g., because of their inherently higher cash resources and ability to effectively diversify risks) and so such firms tend to experience relatively lower costs of capital. Moreover, firms with a high price-to-book ratio, in other words, less growth opportunities, are likely to be less risky and thus have lower costs of equity. This could highlight the importance of property insurance for firms with high growth opportunities. Liquidity is also found to be one of the key factors for investors in pricing equity. Firms with more cash or cash equivalents, tend to be rewarded with lower costs of equity. However, contrary to expectations, evidence is not found to suggest that controlling-minority shareholders incentive conflicts adversely impact on firms value by the increasing the costs of equity. However, this result could reflect the imprecise proxy for controlling-minority shareholders conflicts used in the study. The empirical results further suggest that, consistent with Fama and Jensen (1983), firms with more independent directors on the board are likely to have low costs of equity. Therefore, more independent directors on the board could be perceived by shareholders to reflect 'good' corporate governance as independent directors are likely to be motivated to act independently and prudently in their role as risk monitors on the board.

8.4 Contribution of the Research

The research project provides new and potentially important insights regarding the use of property insurance and firm value in China and as such, it has at least four regulatory/practical implications.

First, this is believed to be the first empirical study to examine the relation between property insurance use and the cost of equity. More importantly, this study makes an

important extension to the risk management literature by identifying a channel through which risk management (insurance) improve firm value. The findings suggest that property insurance is an important corporate finance issue that impacts directly on firms' strategic investment and risk management decision. Indeed, investors are likely take account of commercial property insurance purchased in assessing firm risks and pricing securities. Diamond (1984) also notes that the monitoring function provided by financial institutions (such as insurers) helps to minimize the risk of unexpectedly severe asset loss and control moral hazard (carelessness) by agent-managers. This is also the first piece of research to provide empirical evidence that property insurance specifically reduces the cost of equity by mitigating agency incentive conflicts such as the investment crowding-out and/or managerial risk aversion problems. This is particularly important for firms with high growth opportunities as insurance can help facilitate investment in potentially positive NPV projects. The research is therefore likely to be of interest to insurance suppliers, brokers, managers, industry regulators, investors, amongst others. The U-shape relation identified between the property insurance use and the cost of equity further implies that over-insurance could be detrimental to firm value. This is particularly important to those managers in Chinese PLCs who lack knowledge of risk management/insurance. The study also sheds light on the corporate capital structure decision. For example, the contingent capital attributes of insurance can reduce the level of retained share capital and so maximize reported returns on equity. This attribute is likely to be of interest to current and prospective investors and the financial analyst community.

Second, this study contributes insights on the relation between the cost of equity capital and risk management by utilizing a corporate insurance dataset, whereas most previous risk management studies (e.g., Allayannis and Weston, 2001; Haushalter, et al., 2007; Géczy et al., 1997, 2007) have used financial derivatives. Compared with financial derivatives' data, insurance is an indemnity contract (pure hedge) and so cannot be used for speculation (Zou, 2010). The current study provides a cleaner test of the research hypotheses than would be the case using financial derivatives data.

Third, the linkage between risk management (insurance) and the cost of equity is particularly important in an emerging market, such as China, where the funding of corporate investment opportunities can be obfuscated by severe information asymmetry

problems and poorly developed legal and financial systems. A China-focused study also provides a good opportunity for testing and refining financial economics-based theories (such as agency theory) on the relation between cost of equity and the use of risk management techniques (such as insurance). The research methods and results of this study could thus act as a useful framework and benchmark for future insurance-based research in both China and other Asian countries, particularly those with a similar socio-economic structure and political history to China.

Fourth, China's rapidly expanding financial markets and the increasing number of Chinese companies seeking overseas listing status has offered international investors increased prospects for risk diversification (Zou and Adams, 2006). However, Lee and Rui (2000) observe that a key inhibitor to the efficient operation of financial markets in China is the lack of knowledge held by investors (particularly those from overseas) as to the future growth opportunities of companies. The findings of this research project suggest that agency problems are priced by investors and reflected in higher equity costs. As noted earlier, this is especially important for firms with high growth opportunities as insurance can enable the realization of positive NPV investment. This attribute has economic and political decision-making relevance for investors, financial analysts, policymakers and others with an interest in the Chinese corporate sector.

8.5 Limitations of the Study

Conclusions drawn from this study should, however, be tempered by recognition of some of the limitations associated with the research design. The following four limitations specific to this research project deserve attention. First, as noted in previous chapters, the panel data used in this study were draw from the CIE database which provides insurance spending of parent companies, whereas the cost of equity estimates are at the group level. On the other hand, most of the subsidiaries of parent companies in the study are engaged in the same industries and in general, they are physically located close to that of the parent. As such, the risk profile (and hence the cost of equity) at the level of the corporate group should be very similar to parent. Nevertheless, it is recognized that the results might be biased to some extent as a result of risk profile mismatches. Second, market-based proxies used for some variables (e.g.

a firm's riskiness) could be "noisy", particularly in view of the short time-series of data used (2003-2007) in this study and given the nascent and volatile nature of the domestic stock markets in China. Third, because of the relatively small number of firm/year observations the current study was unable to run quartile regressions and/or change regression analysis to check the robustness of the empirical results. Fourth, due to the absence of analysts forecast data, the study could not experiment with alternative market-based accounting valuation models to estimate the cost of equity which are often deemed to be more reliable than CAPM model.

8.6 Areas for Future Research

There are a few prospective areas for future research highlighted by the results of the present study. First, future research should attempt to employ alternative cost of equity estimation models (e.g., the AEG model) for testing the relation between property and other classes of insurance (e.g., directors and offices (D&O) insurance) and the cost of equity. It is also important to test the robustness of the relation between property insurance and different estimates of the cost of equity, as no widely-accepted approach for estimating the cost of equity exists in the finance literature. Second, future research could explore the insurance-cost of equity relation by using a 'true' level of insurance coverage with deductibles information which more precisely reflects the expected probability and quantum of risks to be covered. Third, new research could incorporate other potentially relevant variables into the analysis of property insurance use and the cost of equity. For example, such factors may include managers' past risk experiences (or firms' historical loss experiences), more accurate industry classification (e.g., a more refined breakdown of manufacturing firms), and/or firms' production diversification strategy as hedging substitutes (which requires segmental reporting data). Fourth, recent empirical research in developed economics such as in Canada (Chen. et al. 2012b) reports that risk management prudence could also directly impact on future levels of equity financing and its cost. However, this study was not able to examine the future effect of property insurance purchase on equity financing due to data unavailability. Future research in such areas, thus could yield interesting insights and contribute to improving our understanding of the effect of corporate risk management (insurance) on firm value, particularly in emerging economies.

8.7 Final Remarks

Corporate risk management (insurance) and its link with the cost of equity is a subject of a considerable importance to managers, investors, regulators and other interested parties. A number of prior studies have examined the effect of hedging on firm value (e.g., see Zou 2010). However, most of studies focus on the impact of risk management decisions (derivatives use) on firm value through future cash flows. The current study makes an important extension to the risk management literature by identifying a channel through which risk management (insurance) improves firm value by examining the relation between property insurance use and the cost of equity in Chinese PLCs. The findings of this study support agency theory-based hypotheses that property insurance could reduce firm's cost of equity by mitigating agency problems. Despite the limitations of the study, it is believed that this research contributes valuable insights on the relation between the corporate purchase of property insurance and the cost of equity. Accordingly, it makes a potentially important contribution the accounting, finance and risk management literature. It is believed that the results of this study could also provide important decision-making insights to managers, investors, policyholders, insurers and other interested parties such as credit rating agencies. Further research could extend this work in several directions, for example, in determining what different corporate stakeholders (e.g., current and prospective investors, managers, policymakers and so on) consider to be the economic value-added qualities of commercial insurance buying, particularly in emerging economies.

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APPENDICES

APPENDIX A: Definition and Description of Dependent, Control and Other variables

Variable Name	Definition	Sign (+/-)	Data Source
Dependent Variables: Equity Risk Premium			
ERP_CAPM(RAW BETA)	Raw beta times the market risk premium of 7%, where the raw beta is estimated by a market model regression using the previous 60 months' returns (at least 24 months)		Datastream
ERP_CAPM(INDUSTRY- ADJUSTED BETA)	Industry-adjusted beta times the market risk premium of 7%, where industry-adjusted beta is the re-levered industry median of unlevered raw beta estimated by a market model regression using the previous 60 months' returns (at least 24 months)		Datastream; CIE
ERP_MPEG	Implied cost of equity based on the MPEG model minus the risk-free rate, where the risk-free rate is defined as yield to maturity of zero coupon one year Chinese Government bond.		CSMAR
Independent Variables			
INS	A dummy variable equals 1 if a firm has property insurance in the fiscal year; 0 otherwise.	-	CIE
INSCOV	The annual (amortized) corporate spending on property insurance scaled by the prior year-end book value of tangible assets (e.g. fixed assets and inventory)	-	CIE
$INSCOV^2$	The square of annual corporate spending on property insurance scaled by the prior year-end book value of tangible assets	+	CIE
Control Variables			
LEV	Long-term debt to total asset ratio, both measured at the beginning to the fiscal year	+	CIE
CASH	Cash and cash equivalent scaled by book value of total assets, both measured at the beginning of the fiscal year	-	CIE
LnMB	Natural logarithm of the ratio of market value of equity to book value of equity. Both are measured at the end of the fiscal year.	+/-	WIND
LnMV	Natural logarithm of the market value of equity, measured at the end of the fiscal year.	-	WIND
UBETA	Systematic risk, measured by raw beta estimated from market model regression using the previous 60 months' returns (at least 24 months) divided by 1 plus the ratio of long-term debt to market value of equity.	+	Datastream; CIE
FERR	Analysts' forecast error, defined as (Actual EPS - consensus analyst forecast EPS)/price.	+/-	CSMAR

Variable Name	Definition	Sign (+/-)	Data Source
NSHARE	The proportion of non-tradable A-share to total shares in issue	+	WIND
STD_ERR	Idiosyncratic risk. Defined as the standard deviation of the residual monthly returns in market model regression using the previous 60 months' stock returns (at least 24 months).	+	Datastream
LnRET12	Price run-up, defined as natural logarithm of 1 plus the compounded stock returns in the previous 12 months.	+/-	Datastream
Other Variables			
STATE_OWN	The proportion of shares held by the State to total shares in issue.	+/-	WIND
MAN_OWN	The proportion of shares held by managers to total shares in issue.	+/-	WIND
BOARDSIZE	Number of board members	+/-	WIND
INDBOARD	Proportion of outside directors to total number on the board.	+/-	WIND
CEO_CHAIR	A dummy variable equals 1 when the CEO is also the Chairman of a firm, and 0 otherwise.	+/-	WIND
HPR_FIRMS	A dummy variable for whether a 'high risk' firm belongs to the manufacturing of chemicals, plastics and rubber, oil and gas extraction/refining, coal mining, and metallurgical engineering industry is denoted as 1, and 0 otherwise.		WIND
CITYDUM	A dummy variable for whether a 'catastrophe risk' firm locates in east coast and central is denoted as 1 and 0 otherwise.		WIND
COD	Cost of borrowing, defined as an average borrowing cost (interest expense charged to the income statement/book value of total debt		CIE
CAPX	Capital expenditure to asset ratio, defined as annual capital expenditure/total asset both at the end of the fiscal year.	-	WIND
NDF	New debt financing, defined as (total liabilities in year t+1 minus total liabilities in year t)/total assets in year t.		CIE
CS	Cash flow to sales ratio defined as (earnings before interest and tax (EBITA) - tax)/sales.		WIND
INSCOV_INDUS_MEDIAN	Industry median of insurance coverage *INSCOV* in the same city excluding the firm in question in the same year.		CIE; WIND
*INS**	Insurance choice fitted by a random-effects probit model with instrument variables(i.e., high property risk firm dummy, city dummy, interest cost of borrowing) and other control variables.	-	

Variable Name	Definition	Sign (+/-)	Data Source
*INSCOV**	Insurance coverage use fitted by a random effects tobit model with instrument variable (industry median of insurance coverage) and other control variables.	-	
$INSCOV^2$*	Squared term of *INSCOV**	+	
INDUS1	A dummy variable equals 1 when a firm is in transportation industry and 0 otherwise.	+/-	WIND
INDUS2	A dummy variable equals 1 when a firm is in information technology industry and 0 otherwise.	+/-	WIND
INDUS3	A dummy variable equals 1 when a firm is in other manufacture industry and 0 otherwise.	+/-	WIND
INDUS4	A dummy variable equals 1 when a firm is in agriculture, forest, animal product and or fishing industry and 0 otherwise.	+/-	WIND
INDUS5	A dummy variable equals 1 when a firm is in medicine or biological product industry, and 0 otherwise.	+/-	WIND
INDUS6	A dummy variable equals 1 when a firm is in construction industry and 0 otherwise.	+/-	WIND
INDUS7	A dummy variable equals 1 when a firm is in real estate industry and 0 otherwise.	+/-	WIND
INDUS8	A dummy variable equals 1 when a firm is in food and beverage industry, and 0 otherwise.	+/-	WIND
INDUS9	A dummy variable equals 1 when a firm is in furniture industry and 0 otherwise.	+/-	WIND
INDUS10	A dummy variable equals one when a firm is in machinery, equipment industry, and zero otherwise.	+/-	WIND
INDUS11	A dummy variable equals 1 when a firm is in utility industry and 0 otherwise.	+/-	WIND
INDUS12	A dummy variable equals 1 when a firm is in electronic appliance industry and 0 otherwise.	+/-	WIND
INDUS13	A dummy variable equals 1 when a firm is in chemical, plastics, rubber, and oil industry, and 0 otherwise.	+/-	WIND
INDUS14	A dummy variable equals 1 when a firm is in textile and clothes industry, and 0 otherwise.	+/-	WIND
INDUS15	A dummy variable equals 1 when a firm is in service industry and 0 otherwise.	+/-	WIND
INDUS16	A dummy variable equals 1 when a firm is in printing and paper industry, and 0 otherwise.	+/-	WIND
INDUS17	A dummy variable equals 1 when a firm is in coal mining and gas extraction/refining industry, and 0 otherwise.	+/-	WIND
INDUS18	A dummy variable equals 1 when a firm is in metallurgical engineering industry and 0 otherwise.	+/-	WIND

APPENDIX B:Variance Inflation Factors (VIF) and Condition Index

Variable	Equation [6.1]	Equation [6.2]	Equation [6.7]
INS	1.07	-	-
INSCOV	-	3.55	3.27
$INSCOV^2$	-	3.41	3.39
LnMB	1.96	2.07	1.60
LnMV	1.52	1.60	1.89
LEV	1.23	1.22	1.24
CASH	1.18	1.18	1.18
STD_ERR	-	1.28	-
UBETA	-	1.81	-
CAPX	-	-	1.11
NSHARE	1.15	1.15	1.14
YEAR DUMMIES			
2004	1.76	1.76	1.75
2005	1.89	2.49	2.44
2006	1.84	1.84	1.77
2007	2.53	2.53	2.40
INDUS1	2.29	2.29	1.39
INDUS2	1.64	1.65	1.95
INDUS3	1.27	1.27	1.4
INDUS4	2.02	2.02	2.62
INDUS5	2.09	2.08	1.05
INDUS6	1.10	1.10	1.14
INDUS7	1.02	1.02	1.08
INDUS8	2.98	2.96	1.02
INDUS9	1.73	1.73	3.96
INDUS10	1.55	1.57	2.03
INDUS11	2.62	2.62	1.80
INDUS12	1.45	1.44	3.43
INDUS13	1.30	1.30	1.66
INDUS14	1.10	1.10	1.32
INDUS15	2.33	2.33	1.47
INDUS16	1.35	1.15	1.14
INDUS17	1.44	1.13	2.89
Mean VIF	1.66	1.82	1.88
The largest condition index in the model	5.66	5.65	5.79

(Source: Research data). This table gives the VIFs of each independent variable and the largest condition index in models [6.1], [6.2], and [6.7] specified in chapter 6 section 6.4. All VIFs are less than 10 indicating that multicollinearity is unlikely to be a problem in the current study (e.g., see Kennedy, 1998, p 190). Variables are defined in Appendix A.

APPENDIX C: The Extent of Property Insurance Use (demeaned *INSCOV* and I*NSCOV*^{2}) and the Cost of equity (*ERP_CAPM*)

	Exp. Sign	*ERP_CAPM (RAW BETA)*	*ERP_CAPM (INDUSTRY ADJUSTED BETA)*
INSCOV_DEMEAN	-	-0.0655**	-0.0360**
		(-1.96)	(-1.88)
INSCOV^2*_DEMEAN*	+	1.0288***	1.1817**
		(3.85)	(2.45)
LnMV	-	-0.0022***	-0.0002**
		(-3.69)	(-2.14)
LnMB	+/-	-0.0005	-0.0014**
		(-1.14)	(-2.56)
LEV	+	0.0008**	0.0403***
		(1.89)	(6.8)
CASH	-	-0.0109**	-0.0065***
		(-1.99)	(-3.04)
NSHARE	+	-0.0015	-0.0004
		(-0.67)	(-1.36)
Year Fixed-effects		yes	yes
Industry fixed-effects		yes	yes
R-Square		0.15	0.46
No of Obs.		1,156	1,156
Inflection point ,where, *INSCOV* =		0.032	0.015

(Source: Research data). This table shows the panel regression results of the extent of property insurance use on the cost of equity using demeaned *INSCOV* and *INSCOV*^{2}-see footnote 44, chapter 7, section 7.6. The dependent variable: risk premium is computed as industry adjusted beta times the market risk premium of 7%, where industry-adjusted beta is re-levered industry median of unlevered raw beta estimated by a market model regression using the previous 60 months returns (at least 24 months). The *t*-statistics are based on robust standard errors adjusted for clustering at the firm level. The labels ***, **, and * indicate significance at the 0.01, 0.05 and 0.10 levels (one-tailed when unidirectional variables have predicted signs and two-tailed otherwise), respectively. Variables are defined in Appendix A.